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For related information see also *Astronautics*.

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Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **761**

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.

For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **761**

89 ASTRONOMY **762**

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **763**

Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **764**

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **765**

Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **765**

Includes cosmic radiation; and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **766**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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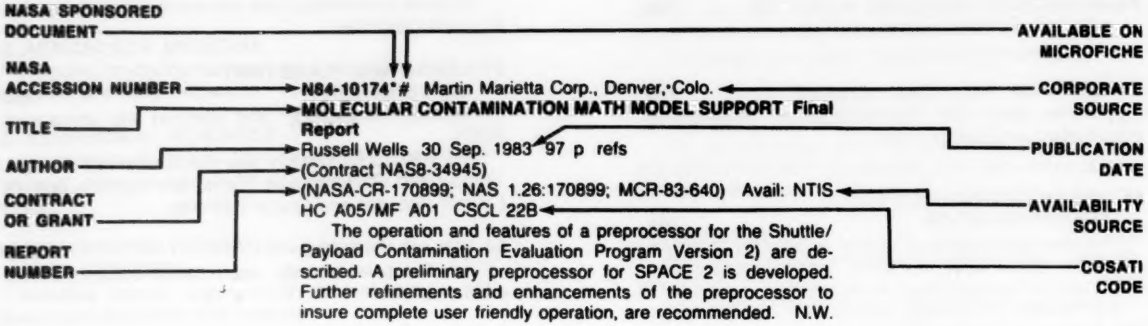
TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B

The operation and features of a preprocessor for the Shuttle/Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 5/MARCH 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-14109 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
ECONOMIC PRODUCTION OF AIRCRAFT STRUCTURES MADE OF FIBER REINFORCED MATERIALS [WIRTSCHAFTLICHE HERSTELLUNG VON FVW-FLUGZEUGSTRUKTUREN]
B. Sarh 11 Jan. 1982 68 p In GERMAN Presented at DGLR Symp. Entwicklung u. Anwendung von CFK-Strukt., Stuttgart, 26-27 May 1982
(MBB-UT-23-82-Oe) Avail: Issuing Activity

Development and production of carbon fiber reinforced (CFR) aircraft structures are discussed. The additional material costs as compared to metal structures are compensated for by the excellent suitability of CFR materials for high grade integral construction, combined with the possibility of a mechanized or automated production. Taking the example by a CFR stabilizer fin and a fuselage front part, production equipment concepts, production methods, and results from production tests are discussed. The influence of the production method on construction, material cost reduction by recycling and semifinished products, processing and mounting cost reduction, and the reasonable weight reduction limit from the point of view of production are presented. Author (ESA)

N84-14110*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FLIGHT TEST OF LAMINAR FLOW CONTROL LEADING-EDGE SYSTEMS
Michael C. Fischer, Andrew S. Wright, Jr., and Richard D. Wagner Dec. 1983 17 p refs Presented at the AIAA Aircraft Design, Systems and Operations Meeting, Fort Worth, Tex., 17-19 Oct. 1983
(NASA-TM-85712; NAS 1.15:85712) Avail: NTIS HC A02/MF A01 CSCL 01B

NASA's program for development of a laminar flow technology base for application to commercial transports has made significant progress since its inception in 1976. Current efforts are focused on development of practical reliable systems for the leading-edge region where the most difficult problems in applying laminar flow exist. Practical solutions to these problems will remove many concerns about the ultimate practicality of laminar flow. To address these issues, two contractors performed studies, conducted development tests, and designed and fabricated fully functional leading-edge test articles for installation on the NASA JetStar aircraft. Systems evaluation and performance testing will be conducted to thoroughly evaluate all system capabilities and characteristics. A simulated airline service flight test program will be performed to obtain the operational sensitivity, maintenance, and reliability data needed to establish that practical solutions exist for the difficult leading-edge area of a future commercial transport employing laminar flow control. Author

N84-14111*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FIBEROPTICS FOR PROPULSION CONTROL SYSTEM
Robert J. Baumbick 1984 15 p refs Proposed for presentation at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 4-7 Jun. 1984; sponsored by ASME
(NASA-TM-83542; E-1913; NAS 1.15:83542) Avail: NTIS HC A02/MF A01 CSCL 20F

In aircraft systems with digital controls, fiberoptics has advantages over wire systems because of its inherent immunity to electromagnetic noise (EMI) and electromagnetic pulses (EMP). It also offers a weight benefit when metallic conductors are replaced by optical fibers. To take full advantage of the benefits of optical waveguides, passive optical sensors are also being developed to eliminate the need for electrical power to the sensor. Fiberoptics may also be used for controlling actuators on engine and airframe. In this application, the optical fibers, connectors, etc. will be subjected to high temperature and vibrations. This paper discussed the use of fiberoptics in aircraft propulsion systems together with the optical sensors and optically controlled actuators being developed to take full advantage of the benefits which fiberoptics offers. The requirements for sensors and actuators in advanced propulsion systems are identified. The benefits of using fiberoptics in place of conventional wire systems are discussed as well as the environmental conditions under which the optical components must operate. B.W.

N84-14112# Michigan State Univ., East Lansing. Dept. of Metallurgy, Mechanics and Materials Science.
EXTENDING THE LIFETIME OF OPERATIONAL SYSTEMS THROUGH CORROSION TRACKING AND PREDICTION Final Report, Sep. 1979 - Feb. 1983
Robert Summitt, Fred T. Fink, Richard Suter, and Nina Samsami Wright-Patterson AFB, Ohio AFWAL Oct. 1983 153 p
(Contract F33615-79-C-5122; AF Proj. 2418)
(AD-A133931; AFWAL-TR-83-4090) Avail: NTIS HC A08/MF A01 CSCL 01/3

Corrosion tracking using the USAF Maintenance Data Collection System was extended to the B-52 fleet, another system of large but elderly aircraft in USAF inventory. This and a study of the C-141A fleet show that MDCS data, together with PACER LIME environmental severity ratings, could provide a basis for optimizing corrosion maintenance, extending operational life of the systems and minimizing overall costs. MDCS is seriously defective, however, and these benefits can not be realized with current data. Changes in USAF maintenance policy, essentially the adoption of reliability-centered, phased inspections, also have produced a different MDCS. These changes are not suitable to the unique problems of corrosion, although the new system may be an improvement with respect to other maintenance requirements. GRA

N84-14113# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FIRST PEEK AT CHINA'S NEW FIGHTERS FOR THE EIGHTIES, THE JIAN-8 AND JIAN-12
22 Sep. 1983 7 p Transl. into ENGLISH from Conmilit (China),

no. 2, Feb. 1983 p 32-33
(AD-A133785; FTD-ID(RS)T-0452-83) Avail: NTIS HC A02/MF A01 CSCL 01/3

The Jian-8 and Jian-12 aircraft are briefly described. Both aircraft can fly over Mach 2. The Jian-8 is powered by two Chinese-built Soviet Tumansky R-11 jet engines and is a variable geometry swing wing fighter. The Jian-12 is powered by a single British Rolls Royce Spey engine and is a delta wing fighter. Weapon systems for the two aircraft are also described. M.G.

N84-14114# Federal Aviation Agency, Washington, D.C. Office of Aviation Policy and Plans.
THE 8TH FAA FORECAST CONFERENCE PROCEEDINGS Annual Report
Feb. 1983 85 p Conf. held at Arlington, Va., 24 Feb. 1983
(AD-A132646; FAA-APO-83-7) Avail: NTIS HC A05/MF A01 CSCL 01/2

The Eighth Annual Aviation Forecast Conference was held on February 24, 1983, in Arlington, Virginia. The general theme of the presentation was Aviation-Forecasting: The State of the Art. The speakers addressed the problems associated with and the expectations of aviation forecast methodologies and their impact on the aviation industry. It was generally agreed that the key problem areas center on economic fluctuations and the need to continue to improve and refine the methodologies used in aviation forecasting. GRA

N84-14115# Logistics Management Inst., Washington, D. C.
THE AIRCRAFT AVAILABILITY MODEL: CONCEPTUAL FRAMEWORK AND MATHEMATICS
T. J. OMalley Jun. 1983 111 p
(Contract MDA903-81-C-0166)
(AD-A132927; AD-F630031; LMI-AF201) Avail: NTIS HC A06/MF A01 CSCL 01/3

The Aircraft Availability Model (AAM) is an analytical model and decision support system that relates expenditures for the procurement and depot repair of recoverable spares to aircraft availability rates, by weapon system. The AAM is based on standard probabilistic and marginal analysis concepts of inventory systems theory. It addresses both the multi-echelon aspect of supply (e.g., depots and bases), and the multi-indenture relations that exist among components. The report provides a complete description of the AAM: what the model does, how it does it, and the underlying mathematics. A description of the U.S. Air Force application to the programming, budgeting, and allocation of resources for recoverable spares is included. Author (GRA)

N84-14116# Siempelkamp Giesserei K. G., Krefeld (West Germany). Maschinen- und Anlagenbau.
DEVELOPMENT OF A PROCESS CONTROLLED PRESSLINE OF ENHANCED TECHNOLOGY FOR THE PRODUCTION OF SHEET METAL PARTS FOR THE AIRCRAFT INDUSTRY BY A HIGH PRESSURE RUBBER PAD SYSTEM Final Report, Jun. 1982
Andrae Richter Bonn Bundesministerium fuer Forschung und Technologie Jun. 1983 97 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-83-006; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,50

A technology for the forming of sheet metal parts for the aircraft industry avoiding nearly all dressing work, and a conveyor system permitting shorter cycle times are described. A high pressure rubber pad press with force 260 MN, specific rubber pressure 700 bar, casing area 2.700 mm x 1.375 mm and rubber pad thickness 400 mm was employed. The rubber pads consisted of polyurethane of 600% ultimate elongation and 60 N/sq mm tensile strength. The conveyor system was linked with a superior level customer tailored control system. Results show reduced cycle times of the complete line which are largely determined by the highly reduced cycle time of the pressing process. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-14117 Michigan Univ., Ann Arbor.
THE STRATIFIED TURBULENT MIXING LAYER: VELOCITY AND CONCENTRATION MEASUREMENTS COMPARED WITH A DISCRETE VORTEX MODEL Ph.D. Thesis
Tzong-Hsi Chen 1983 146 p
Avail: Univ. Microfilms Order No. DA8314254

Relevant flow properties in a stratified turbulent mixing layer were measured, in order to determine if the large scale bulk mixing that occurs can be modeled by inviscid vortex interaction concepts, as proposed by the discrete vortex model. The turbulent velocity and concentration fields were measured using a diagnostic system that employs Rayleigh scattering and laser velocimetry. The measured values of flow quantities are used to assess the validity of the discrete vortex model. The two governing parameters for the experiment, the velocity ratio and the Richardson number were varied to determine the effect of these parameters on the following measured quantities: (1) velocity fluctuation intensities; (2) density fluctuations; (3) mean profiles of velocity and density; (4) the mixing layer thickness; (5) the autocorrelation of velocity fluctuations; and (6) the Reynolds number range over which coherent vortices are observed. Dissert. Abstr.

N84-14118# Poznan Technical Univ. (Poland).
TRANSONIC FLOW OVER AN ISOLATED PROFILE AND THROUGH A CASCADE OF BLADE. PHENOMENOLOGICAL ANALYSIS
R. Pieprzyk and J. Krauze (Polish Inst. for Agriculture) [1983] 19 p refs Transl. into ENGLISH from Tech. Lotnicza i Astronautyczna (Poland), v. 37, Oct. 1982 p 8-13
Avail: NTIS HC A02/MF A01

Fundamental changes that have accurred in recent years in the design of turbocompressors are described, and physical processes associated with transonic flow in compressors are discussed. Particular consideration is given to the pattern of flow past an isolated profile, the interaction between shock waves and the surface layer, changes in the drag and lift coefficients of a profile depending on Mach number, and flow through a plane compressor cascade. For cost and performance effectiveness recent trends in the construction of engines has lead to the intensification of power; in other words, to designs leading to a reduction of the size and mass with a simultaneous increase in developed power. Author

N84-14119*# National Aeronautics and Space Administration, Washington, D. C.
LAMINARIZATION OF A BOUNDARY LAYER IN A SUPERSONIC NOZZLE BY COOLING OF THE SURFACE
V. P. Maksimov and A. A. Maslov Aug. 1983 7 p refs Transl. into ENGLISH from Aerofiz. Issled. (USSR), issue 6, 1976 p 110-112 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77341; NAS 1.15:77341) Avail: NTIS HC A02/MF A01 CSCL 01A

The concept of cooling of the surface of wind tunnel walls in order to laminarize the boundary layer, and thereby eliminate perturbations in the working area, is discussed. Equations are given, which are used to calculate the temperature conditions under which the flow in the boundary layer will be stably laminar. M.G.

N84-14120*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN AND PERFORMANCE OF A FIXED, NONACCELERATING, GUIDE VANE CASCADE THAT OPERATES OVER AN INLET FLOW ANGLE RANGE OF 60 DEG

Jose M. Sanz, Eric R. McFarland, Nelson L. Sanger, Thomas F. Gelder, and Richard H. Cavicchi 1984 18 p refs Proposed for presentation at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME
(NASA-TM-83519; E-1868; NAS 1.15:83519) Avail: NTIS HC A02/MF A01 CSCL 01A

A unique set of wind tunnel guide vanes are designed with an inverse design code and analyzed with a panel method and an integral boundary layer code developed at the NASA Lewis Research Center. The fixed guide vanes, 80 feet long with 6-foot chord length, were designed for the NASA Ames 40 x 80/80 x 120 ft Wind Tunnel. Low subsonic flow is accepted over a 60 deg range of inlet angle from either the 40 x 80 leg or the 80 x 120 leg of the wind tunnel, and directed axially into the main leg of the tunnel where drive fans are located. Experimental tests of 1/10-scale models were conducted to verify design calculations. Author

N84-14121*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTICOMPONENT VELOCITY MEASUREMENT IN A PISON-CYLINDER CONFIGURATION USING LASER VELOCIMETRY
Harold J. Schock, Carolyn A. Regan, William J. Rice, and Richard A. Chlebecek (TSI, Inc., St. Paul) Dec. 1983 19 p refs
(NASA-TM-83534; E-1835; NAS 1.15:83534) Avail: NTIS HC A02/MF A01 CSCL 01A

Because of its nonintrusive nature, Laser Doppler Velocimetry (LDV) has become a popular tool for velocity measurements in internal combustion engines. This work shows how one can use an on-axis measurement technique, in conjunction with the standard two channel LDV technique, to make simultaneous three-component measurements using a single focusing lens. Simultaneous measurement of two of these three components in a piston-cylinder configuration is demonstrated. Author

N84-14122*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
THE USE OF OIL FOR IN-FLIGHT FLOW VISUALIZATION
Robert E. Curry, Robert R. Meyer, Jr., and Maureen OConnor Jan. 1984 17 p refs Presented at 14th Ann. Symp. of the Soc. of Flight Test Engr., Newport Beach, Cal., 15-19 Aug. 1983 Prepared in cooperation with NASA, Ames Research Center
(NASA-TM-84915; H-1195; NAS 1.15:84915) Avail: NTIS HC A02/MF A01 CSCL 01A

Oil was used to visualize inflight aerodynamic characteristics such as boundary layer transition, shock wave location, regions of separated flow, and surface flow direction. The technique, which is similar to wind tunnel oil-flow testing, involves an oil mixture to test aircraft before takeoff. After takeoff, the airplane climbs immediately to the test altitude and photographs are taken. The developmental experience is summarized, several examples of inflight oil-flow photographs are presented and discussed, and an approach for potential users of the technique is presented. Author

N84-14123*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THREE-DIMENSIONAL IMPLICIT LAMBDA METHODS Final Report
M. Napolitano and A. Dadone Oct. 1983 23 p refs Sponsored in part by Consiglio Nazionale delle Ricerche
(Contract NAS1-17070)
(NASA-CR-172264; NAS 1.26:172264; Rept-83-62) Avail: NTIS HC A02/MF A01 CSCL 01A

This paper derives the three dimensional lambda-formulation equations for a general orthogonal curvilinear coordinate system and provides various block-explicit and block-implicit methods for solving them, numerically. Three model problems, characterized by subsonic, supersonic and transonic flow conditions, are used to assess the reliability and compare the efficiency of the proposed methods. Author

N84-14124# Dayton Univ., Ohio. School of Engineering.
NONLINEAR OSCILLATIONS OF A FLUTTERING PANEL IN A TRANSONIC AIRSTREAM Final Report, 1 May 1981 - 1 May 1982
Franklin E. Eastep Apr. 1983 110 p
(Grant AF-AFOSR-01340-81; AF Proj. 2307)
(AD-A133918; UDR-TR-83-43; AFOSR-83-0858TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

A flutter analysis has been conducted on a simply supported panel to demonstrate the successful combining of the panel (Von Karman) large deflection equations with a linear aerodynamic (Piston) theory for determining the panel response. The panel response was determined by coupling a Galerkin modal representation with a numerical time integration scheme. The time integration scheme was also successfully used to obtain the linear structural (small-deflection) response to a nonlinear aerodynamic pressure. Because the representation of the nonlinear panel response by a linear superposition of linear mode shapes is very questionable, the Von Karman large deflection equations were replaced by a large deflection finite-element representation. The nonlinear panel response of the finite-element model was obtained using Piston theory aerodynamics and it is recommended that the finite-element response be determined for a nonlinear aerodynamic pressure. GRA

N84-14125# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SOME AERODYNAMIC CHARACTERISTICS OF A PROJECTILE SHAPE WITH A NONAXISYMMETRIC BOATTAIL AT MACH NUMBERS OF 0.91 AND 3.02 Final Report
Lyle D. Kayser and Fred Whiton, Jr. Sep. 1983 48 p
(DA Proj. 1L1-62618-AH-80)
(AD-A133755; AD-F300330; ARBRL-TR-02525) Avail: NTIS HC A03/MF A01 CSCL 19/1

Some aerodynamic properties of a projectile shape with a nonaxisymmetric boattail are presented. The boattail is formed by machining three flat surfaces which are equally spaced and inclined seven degrees to the model axis. Aerodynamic forces obtained by strain-gage balance measurements are presented for angles of attack up to 15 degrees and for various roll orientation of the model. Because the effect of roll orientation on coefficient data is quite small, coefficients are presented in incremental form so that the effect of roll can be graphically amplified. A limited quantity of the data is compared to computational results for Mach 3.02. The results of this study support previous studies which show that nonaxisymmetric boattail shapes can improve the static stability of projectiles. GRA

N84-14126# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPUTATIONAL MODELING OF AERODYNAMIC HEATING FOR XM797 NOSE CAP CONFIGURATIONS Final Report
Walter B. Sturek, Lyle D. Kayser, Donald C. Mylin, and Henry Hudgins Sep. 1983 45 p Supersedes ARBRL-IMR-684, ARBRL-IMR-694, ARBRL-IMR-706.e
(DA Proj. 1L1-62618-AH-80)
(AD-A133684; AD-F300321; ARBRL-TR-02523; ABRL-IMR-684; ARBRL-IMR-694; ARBRL-IMR-706.e) Avail: NTIS HC A03/MF A01 CSCL 19/1

The XM797 is a proposed training round for the 105mm M735 high velocity projectile. This projectile is designed to have a trajectory that closely follows that of the M735 yet have a maximum range of 8km. To achieve this performance the XM797 is designed with a nose cap made of zinc alloy which, due to structural weakening caused by aerodynamic heating and centrifugal loads due to spin, is supposed to fail and result in the projectile breaking apart. This paper summarizes the results of a computational study of the effects of aerodynamic heating for several zinc alloy and steel nose cap configurations for flight conditions pertinent to the development testing of the shell. The computational results were obtained using the ABRES Shape Change Code (ASCC) developed by Acurex/Aerotherm for numerically modeling the in-depth unsteady temperature response of an ablating reentry vehicle. Examples of the in-depth temperature response of XM797 nose cap configurations are shown which demonstrate the capability of the code to predict the effects of ablation, location of boundary layer transition, projectile preconditioning temperature, and atmospheric conditions. Comparisons of the computational results to the results of test firings are shown which have provided assistance in the anlaysis of the projectile performance. GRA

N84-14127# Aeronautical Research Labs., Melbourne (Australia).
AN APPLICATION OF THE FINITE ELEMENT METHOD TO THE SOLUTION OF LOW REYNOLDS NUMBER, INCOMPRESSIBLE FLOW AROUND A JOUKOWSKI AEROFOIL, WITH EMPHASIS ON AUTOMATIC GENERATION OF GRIDS
T. Tran-Cong Jun. 1983 32 p
(AD-A133008; ARL-AERO-TM-349) Avail: NTIS HC A03/MF A01 CSCL 09/2

The problems of external flows around aircraft, internal flows inside propulsions units and also related problems like structural designs all require more and more accurate solutions while incorporating state of the art features involving more and more complex geometries and loadings. This is steadily becoming beyond the reach of analytical solution methods and thus necessitates the use of new computational methods. One of these is the Finite Element Method. The Finite Element Method was initially developed and used by Zienkiewicz for elasticity problems and is at the height of its development at the time of writing. The method is being studied theoretically as well as being applied to a broader and broader range of problems; its applications are found in solid mechanics, fluid mechanics, electromagnetics, etc. Some FORTRAN programs have been written in order to apply the Finite Element Method to the solution for low Reynolds number, incompressible flows around a Joukowski aerofoil, with emphasis on the generation of grids. These programs serve as evaluation tools and as a first step in a planned longer-term study of the Finite Element Method as applied to fluid flow problems. GRA

N84-14128# Georgia Inst. of Tech., Atlanta.
STUDY OF TURBULENT FLOW IN A WING-FUSELAGE TYPE JUNCTURE Ph.D. Thesis
L. R. Kubendran 1983 176 p
Avail: Univ. Microfilms Order No. DA8315357

The turbulent flow field in a wing-fuselage type junction has been investigated. The wing and fuselage are simulated by using a body of constant thickness mounted perpendicular to a large flat plate. The body has an elliptical leading edges, and a two dimensional turbulent boundary layer is developing on the flat plate far upstream of the body nose. The measurements were conducted at three-streamwise stations upstream of the body and at three stations in the juncture downstream of the body leading edge. Two single-sensor hot-wire probes were used in the measurements. The measurements included three mean velocities and six Reynolds stresses in the regions where the flow was not separated. Some exploratory work, using hot wires, was carried out within the separated region to assess the usefulness of hot-wire techniques in reversed flow. The data acquisition technique employed here allows a hot wire to be used in reversed flow to indicate flow direction. All of the collected data have been analyzed to deduce the general flow behavior and to trace the history of the spearation vortex. Dissert. Abstr.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-14129*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA B-57B SEVERE STORMS FLIGHT PROGRAM
Weneth D. Painter and Dennis W. Camp Dec. 1983 25 p refs
(NASA-TM-84921; NAS 1.15:84921; H-1196) Avail: NTIS HC A02/MF A01 CSCL 01C

The B-57B Severe Storms Flight Program gathers data to characterize atmosphere anomalies such as wind shear, turbulence, and microbursts at altitudes up to 1000 feet (300 meters). These data are used to enhance the knowledge of atmospheric processes, to improve aviation safety, to develop systems technology and piloting technique for avoiding hazards and to increase the understanding of the causes of related aircraft accidents. The NASA Dryden Flight Research Facility B-57B aircraft has participated in several severe storms data collection programs such as the Joint Airport Weather Studies (JAWS) located in Denver, Colorado area, Operation Rough Rider located in the Norman, Oklahoma area with the National Severe Storms Laboratory, and Mountain and desert turbulence in the Edwards Air Force Base, California area. Flight data are presented from flights which encountered the wind shear, turbulence and microburst anomalies. These flight results are discussed and some conclusions are made relating to these atmospheric anomalies. Author

N84-14130# IIT Research Inst., Chicago, Ill.
FIRE MANAGEMENT-SUPPRESSION SYSTEM-CONCEPTS RELATING TO AIRCRAFT CABIN FIRE SAFETY Final Report, 26 Sep. 1980 - 28 Feb. 1982
K. R. Miniszewski, T. E. Waterman, J. A. Campbell (Gage-Babcock and Associates, Inc., Elmhurst, Ill.), and F. Salzberg (Gage-Babcock and Associates, Inc., Elmhurst, Ill.) Jul. 1982 157 p refs
(Contract DTFA30-80-C-00092)
(FAA-CT-82-134; J06532/C06554) Avail: NTIS HC A08/MF A01

A comprehensive review of the applicability of fire protection (management/suppression) system (or concepts) to aircraft cabin fire safety was done. Both inflight fire and post crash fires were considered. Establishment and documentation of the feasibility of each system/concept, determination of costs and benefits for systems judged feasible, and development of test programs to evaluate systems for unknown (undocumented) feasibility were included. A literature search to document the curse and consequences of past accidents, and the degree to which various fire protection concepts were developed was included. Fire scenarios were developed from accident histories and engineering analysis, and used to assist in judging the potential of the various system/concepts examined. Fire prevention, detection, confinement, and suppression; handling of combustion products; and escape aids were studied. Author

N84-14131# Douglas Aircraft Co., Inc., Long Beach, Calif.
DOUGLAS AIRCRAFT COMPANY ADVANCED CONCEPT EJECTION SEAT (ACES 2), REVISION C
1983 26 p
(Contract F33657-81-C-2100)
(AD-A133628; MDC-J4576-REV-C) Avail: NTIS HC A03/MF A01 CSCL 01/3

ACES 2 (Advanced Concept Ejection Seat) is a high-performance escape system. The increased performance capability greatly improves the survivability of aircrews during escape from aircraft under adverse conditions throughout the flight envelope. ACES 2 is a rugged, lightweight, easy to maintain ejection seat with advanced-technology subsystems. The subsystems were designed, tested, and qualified in the USAF/Douglas ACES 1 program, and are integral in the all-new seat structure of ACES 2. ACES 2 seat systems are currently being manufactured for installation in F-15A/B, F-16A/B, and A-10 aircraft as the standard USAF Government-furnished ejection seat. It includes the following features: Multiple operating modes to optimize performance over the 0 to 600-KEAS escape envelope; Self-contained sensing of escape conditions for recovery mode selection; Electronics for sequencing and precision timing in each mode; Gyro-controlled vernier rocket for positive stabilization at low speeds; Hemisflo drogue parachute for stabilization and deceleration at high speeds and high Mach numbers; and Mortar-deployed recovery parachute for consistent, positive operation. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-14132* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MAGNETIC HEADING REFERENCE Patent
H. Douglas Garner, inventor (to NASA) Issued 6 Dec. 1983 16 p Filed 9 Apr. 1982 Supersedes N82-26260 and N82-24726 (20 - 17, p 2351) (20 - 15, p 2122)
(NASA-Case-LAR-12638-1; US-Patent-4,418,480; US-Patent-Appl-SN-367187; US-Patent-Class-33-348; US-Patent-Class-33-356; US-Patent-Class-33-361; US-Patent-Class-33/DIG.3) Avail: US Patent and Trademark Office CSCL 17G

Devices are disclosed for vectorially summing two signals. In a first embodiment, the vectorial summation is implemented by a mechanical sin/cos mechanism in which a crank drives two linear potentiometers out of phase. In a second embodiment, a polarized light resolver generates the sin and cos functions. In a third embodiment, a printed circuit resolver generates the sin and cos functions.
Official Gazette of the U.S. Patent and Trademark Office

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-14133 Michigan Univ., Ann Arbor.
OPTIMUM AERODYNAMIC MANEUVERS OF ORBITING VEHICLES Ph.D. Thesis
David Allen Gell 1983 140 p
Avail: Univ. Microfilms Order No. DA8314276

A mathematical model, employing a modification of Chapman's nondimensional variables, is used to describe the motion of a spacecraft encountering a planetary atmosphere. This model is used to investigate atmospheric maneuvers that may improve the performance of an orbiting vehicle by reducing the fuel required to maneuver. Three classes of maneuvers are studied, reentry, aerocapture and plane change. For reentry, closed form solution for the maximum lift-to-draft ratio, E*, is developed and used to select the constant bank angle which maximizes crossrange. This optimum bank angle is found to be a function of E*. For aerocapture, the model is used to study the effect of lift coefficient and approach on the final orbit achieved. The analysis develops expressions for the nondimensional variables at the interface with the sensible atmosphere in terms of two parameters. The first parameter is the pericenter parameter, defined as the value of Chapman's attitude variable evaluated at the pericenter of the approach orbit. The second parameter is the ratio of aerodynamic to gravitational force for which a significant variation from the Keplerian trajectory is expected. Dissert. Abstr.

N84-14134 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
CONNECTION OF LARGE AIRBUS COMPONENTS TAKING EXAMPLE OF CONTROL SURFACES JUNCTIONS [ANSCHLUESSE VON GROSSBAUTEILEN DES AIRBUS AN BEISPIELEN VON LEITWERKSVER-BINDUNGEN]
H. Brenneis 7 Dec. 1982 115 p In GERMAN Presented at Technische Univ. Munich and Hochschule der Bundeswehr, Munich Sem. fuer Leichtbau WS 82/83, Munich
(MBB-UT-07-82-Oe) Avail: Issuing Activity

The construction of control surfaces junction of the Airbus family (A300, A310, A310-600, and A320) is commented on. Industrial aspects (worksharing, production method, mounting costs), airliner requirements (repair, handling, inspectability, inspection frequency), and legal requirements (construction regulations) are considered. These aspects are also considered for the Boeing 737, 757, and 767; Mercure, Douglas DC10, and Transall C160. Author (ESA)

N84-14135# National Aeronautical Establishment, Ottawa (Ontario).
EVALUATION OF THE EFFECTS OF LATERAL AND LONGITUDINAL APERIODIC MODES ON HELICOPTER INSTRUMENT FLIGHT HANDLING QUALITIES
S. R. M. Sinclair and S. Kereliuk Jul. 1983 34 p
(AD-A134116; NAE-AN-15; NRC-22576) Avail: NTIS HC A03/MF A01 CSCL 01/2

This report describes a part of a larger program funded by the US Federal Aviation Administration and the National Aeronautical Establishment to provide background information on instrument flight handling qualities of helicopters. This latest series of tests was aimed at addressing the acceptability of pitch and roll aperiodic characteristics when performing general handling and mission oriented tasks in the NAE Airborne simulator. In general, the results of these tests are consistent with proposed requirements for helicopter IFR handling qualities. Two significant factors were highlighted in these tests: aircraft characteristics which were not specifically under study may have affected pilot opinions; and changes in pilot opinion occurred depending on whether the task was one of general handling or was specifically mission oriented. Author (GRA)

N84-14136# Naval Postgraduate School, Monterey, Calif. Dept. of Electrical Engineering.
BANK-TO-TURN CRUISE MISSILE TERMINAL GUIDANCE AND CONTROL LAW COMPARISON M.S. Thesis
Kent B. Watterson Jun. 1983 190 p
(AD-A132595) Avail: NTIS HC A09/MF A01 CSCL 16/4

This work consists of the development of the six degree of freedom non-linear model of a sea launched generic bank-to-turn cruise missile attacking a medium sized combatant ship. Two guidance and control schemes are compared in the terminal phase. The first, or baseline guidance scheme (pop out maneuver), uses a 50-foot altitude hold for an ingress phase, followed by a pop out maneuver, and then an attack phase which uses proportional navigation in elevation and azimuth planes along with bank-to-turn maneuvering. The second scheme (sea skimmer) uses identical ingress and attack phases but eliminates the pop out maneuver. Miss distances for both schemes are compared while varying missile roll rate limit, ECM blinking frequency, and burn through ranges. Author (GRA)

N84-14137# Air Force Flight Test Center, Edwards AFB, Calif. Flight Test Technology Branch.
HYDRAULIC SUBSYSTEMS FLIGHT TEST HANDBOOK Final Report
Kenneth J. Lush Aug. 1983 132 p
(AD-A132633; AFFTC-TIH-83-2) Avail: NTIS HC A07/MF A01 CSCL 01/3

This Handbook provides AFFTC (Air Force Flight Test Center) engineers with guidelines for the testing of aircraft hydraulic subsystems. Future technological advances, characteristics of individual aircraft and test programs and cost constraints may necessitate other methods being used in some cases. A background is provided on aircraft hydraulic subsystems and the requirements to which they are designed. Details are provided of individual tests, test support requirements and evaluation criteria and suggestions made for presentation of results. Author (GRA)

N84-14138# Systems Technology, Inc., Hawthorne, Calif.
TENTATIVE STOL (SHORT-TAKEOFF-AND-LANDING) FLYING

QUALITIES CRITERIA FOR MIL STANDARD AND HANDBOOK Final Report, Jun. 1982 - Jun. 1983
Roger H. Hoh and David G. Mitchell Wright-Patterson AFB, Ohio AFWAL Jun. 1983 159 p
(Contract F33615-80-C-3604; AF Proj. 2403)
(AD-A132857; STI-TR-1163-3; AFWAL-TR-83-3059) Avail: NTIS HC A08/MF A01 CSCL 01/3

A move is underway in the military services to expand the scope of the military flying qualities specification, MIL-F-8785C to include STOL flying qualities. This report is the result of review, analysis and unification of existing STOL flying qualities data in a form facilitating inclusion into the new MIL Standard and Handbook, particularly in the area where STOL aircraft differ from CTOL aircraft. The report recommends proposed requirements where sufficient data exist; the report presents discussion where data are sparse or non-existant. Author (GRA)

N84-14139# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION OF THE UH-60A CONFIGURED WITH THE EXTERNAL STORES SUPPORT SYSTEM (ESSS) Final Report, 4 Dec. 1982 - 26 Jan. 1983
Arthur R. Marshall, Randall G. Oliver, Robert M. Buckanin, and Richard S. Adler Mar. 1983 88 p
(AD-A132964; AD-F300304; USAAEFA-82-14) Avail: NTIS HC A05/MF A01 CSCL 01/3

The Preliminary Airworthiness Evaluation of the UH-60A helicopter configured with the External Stores Support System was conducted. A total of 26 test flights were conducted. Limited level flight performance tests were conducted to determine the change in drag of the UH-60A helicopter caused by three External Stores Support System configurations with various stores installed. An unexplained increase in power required was found between the Preliminary Airworthiness Evaluation test aircraft and the aircraft used during a previous Airworthiness and Flight Characteristics evaluation. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-14140# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
FIXED-BASE SIMULATOR INVESTIGATION OF DISPLAY/SCAS REQUIREMENTS FOR ARMY HELICOPTER LOW-SPEED TASKS
Dean Carico, Christopher L. Blanken, Courtland C. Bivens, and Patrick M. Morris 1983 21 p Presented at the 39th Ann. Forum of the Am. Helicopter Soc., St. Louis, 9-11 May 1983
(AD-A134123) Avail: NTIS HC A02/MF A01 CSCL 01/4

A piloted simulation was conducted to investigate the effect of presenting flight symbology on a panel mounted display (PMD) versus a head up display (HUD) for different levels of augmentation and turbulence while performing low speed tasks representative of the scout helicopter mission. A secondary objective was to investigate the advantages of using a collective kinesthetic tactual display (KTD) for altitude control during a precision hover task. The results show that the display symbology from either the HUD or PMD improved the pilot ratings for low levels of augmentation. The KTD helped the pilot reduce altitude drift during the precision hover task for the low to mid augmentation levels, but it had little effect on pilot ratings. GRA

N84-14141# Rockwell International Corp., Columbus, Ohio. Applied Research Dept.
FLIGHT EVALUATION OF A LINEAR OPTICAL DISPLACEMENT TRANSDUCER Final Report, Jun. 1982 - May 1983
Ernest J. Solomon Indianapolis, Ind. Naval Avionics Center May 1983 127 p
(Contract N00163-82-C-0232)
(AD-A132638; NR83H-20; NAC-TR-2329) Avail: NTIS HC A07/MF A01 CSCL 01/4

The flight demonstration and evaluation of the operation of the MIL-T-85289 Linear Optical Displacement Transducer (LODT) as an active sensing unit of the Advanced Flight Control Actuation System in a T-2C aircraft were successfully accomplished. The test installation contained a LODT as the rudder position feedback device, fiber optic link, computer interface unit, microcomputer, direct-drive rudder actuator, electronic drive unit, force transducers, and a localized 8000 PSI (55 MPa) hydraulic supply. The system met all laboratory and flight test objectives and demonstrated that the LODT represents a viable approach to EMI immunity in advanced aircraft control systems. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-14142 Cincinnati Univ., Ohio.
INVESTIGATION OF SMALL PARTICLE TRAJECTORIES THROUGH TURBOMACHINERY ENVIRONMENTS Ph.D. Thesis
Brent Franklin Beacher 1983 164 p
Avail: Univ. Microfilms Order No. DA8313490

This investigation concerns the motion of small particles through aerodynamic environments representative of those found in multistage turbomachinery. The well-known theory describing such particle motion is applied in a manner that produces more accurate representations of the particle trajectory paths. This greater accuracy is achieved by a recognition of the three dimensional variations that exist in the gas flow properties and in the geometries of the blading and flowpath. Improved descriptions of the particle rebound characteristics also contribute to this greater accuracy. Analyses are performed in the environments of a two dimensional wind tunnel used for erosion testing, a 90 degree inlet duct configuration, and an axial multistage turbine. The results of the particle trajectory calculations correspond to the patterns of erosion observed during experimental testing of these systems. Dissert. Abstr.

N84-14143*# Solar Turbines International, San Diego, Calif.
EXPERIMENTAL STUDY OF THE OPERATING CHARACTERISTICS OF PREMIXING-PREVAPORIZING FUEL/AIR MIXING PASSAGES Final Report
David A. Rohy and J. G. Meier Nov. 1983 60 p
(Contract NAS3-20662)
(NASA-CR-168279; NAS 1.26:168279; SR83-R-4663-30) Avail: NTIS HC A04/MF A01 CSCL 21E

Fuel spray and air flow characteristics were determined using nonintrusive (optical) measurement techniques in a fuel preparation duct. A very detailed data set was obtained at high pressures (to 10 atm) and temperatures (to 750 K). The data will be used to calibrate an analytical model which will facilitate the design of a lean premixed prevaporized combustor. This combustor has potential for achieving low pollutant emissions and low levels of flame radiation and pattern factors conductive to improved durability and performance for a variety of fuels. Author

N84-14144*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARISON OF FLIGHT RESULTS WITH DIGITAL SIMULATION FOR A DIGITAL ELECTRONIC ENGINE CONTROL IN AN F-15 AIRPLANE

Lawrence P. Myers and Frank W. Burcham, Jr. Oct. 1983 19 p refs
(NASA-TM-84903; NAS 1.15:84903) Avail: NTIS HC A02/MF A01 CSCL 21E

Substantial benefits of a full authority digital electronic engine control on an air breathing engine were demonstrated repeatedly in simulation studies, ground engine tests, and engine altitude test facilities. A digital engine electronic control system showed improvements in efficiency, performance, and operation. An additional benefit of full authority digital controls is the capability of detecting and correcting failures and providing engine health diagnostics. Author

N84-14145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CERAMIC COMPOSITE LINER MATERIAL FOR GAS TURBINE COMBUSTORS

Daniel B. Ercegovic, Curtis L. Walker, and Carl T. Norgren 1984 19 p refs Presented at the 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984; sponsored by AIAA Prepared in cooperation with Army Aviation Research and Development Command, Cleveland
(NASA-TM-83490; E-1819; NAS 1.15:83490; AVRADCOM-TR-83-C-11) Avail: NTIS HC A02/MF A01 CSCL 21E

Advanced commercial and military gas turbine engines may operate at combustor outlet temperatures in excess of 1920 K (3000 F). At these temperatures combustors liners experience extreme convective and radiative heat fluxes. The ability of a plasma sprayed ceramic coating to reduce liner metal temperature has been recognized. However, the brittleness of the ceramic layer and the difference in thermal expansion with the metal substrate has caused cracking, spalling and some separation of the ceramic coating. Research directed at turbine tip seals (or shrouds) has shown the advantage of applying the ceramic to a compliant metal pad. This paper discusses recent studies of applying ceramics to combustor liners in which yttria stabilized zirconia plasma sprayed on compliant metal substrates which were exposed to near stoichiometric combustion, presents performance and durability results, and describes a conceptual design for an advanced, small gas turbine combustor. Test specimens were convectively cooled or convective-transpiration cooled and were evaluated in a 10 cm square flame tube combustor at inlet air temperatures of 533 K (500 F) and at a pressure of 0.5 MPa (75 psia). The ceramics were exposed to flame temperatures in excess of 2000 K (3320 F). Results appear very promising with all 30 specimens surviving a screening test and one of two specimens surviving a cyclic durability test. Author

N84-14146*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A REVIEW OF NASA COMBUSTOR AND TURBINE HEAT TRANSFER RESEARCH

Richard A. Rudey and Robert W. Graham 1984 26 p refs Proposed for presentation at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME
(NASA-TM-83541; E-1912; NAS 1.15:83541) Avail: NTIS HC A03/MF A01 CSCL 21E

The thermal design of the combustor and turbine of a gas turbine engine poses a number of difficult heat transfer problems. The importance of improved prediction techniques becomes more critical in anticipation of future generations of gas turbine engines which will operate at higher cycle pressure and temperatures. Research which addresses many of the complex heat transfer processes holds promise for yielding significant improvements in prediction of metal temperatures. Such research involves several kinds of program including: (1) basic experiments which delineate the fundamental flow and heat transfer phenomena that occur in the hot sections of the gas turbine but at low enthalpy conditions; (2) analytical modeling of these flow and heat transfer phenomena which results from the physical insights gained in experimental research; and (3) verification of advanced prediction techniques in facilities which operate near the real engine thermodynamic conditions. In this paper, key elements of the NASA program which involves turbine and combustor heat transfer research will be described and discussed. B.W.

N84-14147*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW VISUALIZATION AND INTERPRETATION OF VISUALIZATION DATA FOR DEFLECTED THRUST V/STOL NOZZLES

H. C. Kao, P. L. Burstadt, and A. L. Johns 1984 51 p refs Presented at the 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984; sponsored by AIAA
(NASA-TM-83554; E-1933; NAS 1.15:83554) Avail: NTIS HC A04/MF A01 CSCL 21E

Flow visualization studies were made for four deflected thrust nozzle models at subsonic speeds. Based on topological rules and the assumption that observed streaks constitute continuous vector fields, available visualization pictures are interpreted and flow patterns on interior surfaces of the nozzles are synthesized. In particular, three dimensional flow structure and separations are discussed. From the synthesized patterns, the overall features of the flow field in a given nozzle can be approximately perceived. Author

N84-14148*# Textron Bell Aerospace Co., Buffalo, N. Y.

NASTRAN FLUTTER ANALYSIS OF ADVANCED TURBOPROPELLERS Final Report

V. Elchuri and G. C. C. Smith Apr. 1982 121 p refs
(Contract NAS3-22533)
(NASA-CR-167926; NAS 1.26:167926; D2536-941009) Avail: NTIS HC A06/MF A01 CSCL 02A

An existing capability developed to conduct modal flutter analysis of tuned bladed-shrouded discs in NASTRAN was modified and applied to investigate the subsonic unstalled flutter characteristics of advanced turbopropellers. The modifications pertain to the inclusion of oscillatory modal aerodynamic loads of blades with large (backward and forward) variable sweep. The two dimensional subsonic cascade unsteady aerodynamic theory was applied in a strip theory manner with appropriate modifications for the sweep effects. Each strip is associated with a chord selected normal to any spanwise reference curve such as the blade leading edge. The stability of three operating conditions of a 10-bladed propeller is analyzed. Each of these operating conditions is iterated once to determine the flutter boundary. A 5-bladed propeller is also analyzed at one operating condition to investigate stability. Analytical results obtained are in very good agreement with those from wind tunnel tests. Author

N84-14149# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

THE VTX DUTY CYCLE DEVELOPED FROM T-2C AND TA-4J ENGINE USAGE DATA Final Report

Scott M. Cote 22 Jun. 1983 15 p
(AD-A133992; NADC-83048-60) Avail: NTIS HC A02/MF A01 CSCL 21/5

A T-2C and a Ta-4J aircraft were suitably instrumented for recording engine usage data. These aircraft flew typical training profiles which were obtained via pilot interviews. Based on flight data, the duty cycles were calculated for each trainer to establish design requirements which apply to the VTX system. A VTX duty cycle was developed from this study. Author (GRA)

N84-14150# California Inst. of Tech., Pasadena.

MECHANISMS OF EXCITING PRESSURE OSCILLATIONS IN RAMJET ENGINES Interim Report, 20 Aug. 1980 - 19 Aug. 1981

F. E. C. Culick, F. E. Marble, and E. E. Zukoski 1 Oct. 1982 10 p
(Grant AF-AFOSR-0265-80; AF Proj. 2308)
(AD-A133977; AFOSR-83-0875TR) Avail: NTIS HC A02/MF A01 CSCL 21/5

This report covers the first year of an experimental and analytical program concerned with problems of pressure oscillations in ramjet engines. Initial tests have been performed showing that the blowdown facility operates as planned; modifications for operation at higher pressure have been started. An analysis of the response of a normal shock wave to pressure oscillations has been completed and will be used as the upstream boundary condition in calculations of the acoustical field. Construction of a general framework for analyzing the instabilities in engines has been started, including modeling of the steady flow field. Special attention is being directed to unsteady shear layers and combustion in a vortex as a mechanism for exciting pressure oscillations. Utilizing the physical model derived from the transient burning of a flame in a vortex field, it has been possible to correlate screech data for a wide variety of fuels. Author (GRA)

N84-14151# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
RESEARCH ON AERO-THERMODYNAMIC DISTORTION INDUCED STRUCTURAL DYNAMIC RESPONSE OF MULTI-STAGE COMPRESSOR BLADING Annual Summary Report, 15 Apr. 1982 - 14 Apr. 1983
Sanford Fleeter Jun. 1983 56 p
(Grant AF-AFOSR-0188-82; AF Proj. 2307)
(AD-A133853; ME-TSPC-TR-83-04; AFOSR-83-0737TR) Avail: NTIS HC A04/MF A01 CSCL 21/5

The overall objective of this research is to quantitatively investigate the fundamental phenomena relevant to aerothermodynamic distortion-induced structural dynamic blade response in multi-stage gas turbine fans and compressors. Unique unsteady aerodynamic data will be obtained to validate and indicate necessary refinements to state-of-the-art analyses and to direct the modeling of new analyses. Also, for the first time, a first principles capability to predict the vibrational response amplitude of blading due to aerodynamic excitations will be developed. Progress and results obtained during the first year of this program. Include: the dynamic instrumentation of the first-stage vane row of a three-stage research compressor; the design, specification, and initiation of the development of the dynamic data acquisition and analysis system; the initiation of the development of the necessary data analysis and calibration techniques; and the theoretical development of a unique coupled mode structural dynamic blade response analysis based on an energy balance technique. GRA

N84-14152# Naval Weapons Center, China Lake, Calif.
TURBULENT MIXING AND COMBUSTION OF MULTI-PHASE REACTING FLOWS IN RAMJET AND DUCTED ROCKET ENVIRONMENT Final Progress Report, 1 Apr. 1981 - 30 Sep. 1982
M. J. Lee and K. C. Schadow Oct. 1982 6 p
(Grant AFOSR-MIPR-82-00010; AF Proj. 2308)
(AD-A133802; AFOSR-83-0872TR) Avail: NTIS HC A02/MF A01 CSCL 21/5

Experiments with gaseous fuels to establish the base for the multiphase fuel tests were completed for the axisymmetric-coaxial flow fields. Radial and axial profiles of pressure, velocity, species concentration and temperature were determined. Agreement between measured values (velocity and temperature) and computer predictions was, in general, reasonably good. Experiments to determine axial and radial temperature profiles with boron particle-laden fuels were started. Author (GRA)

N84-14153# Naval Postgraduate School, Monterey, Calif.
POWERPLANT SELECTION FOR CONCEPTUAL HELICOPTER DESIGN M.S. Thesis
Timothy Joseph Casey Jun. 1983 127 p
(AD-A132982) Avail: NTIS HC A07/MF A01 CSCL 21/5

A method of optimizing the selection of a power plant based upon engine and fuel weight is developed for use in a conceptual helicopter design course. Historical data is analyzed to verify and modify existing formulae used to estimate engine performance and engine installation weight. Computational programs for use on a hand-held computer and the IBM 3033 are developed to predict analytically engine fuel flow characteristics and to optimize engine selection. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-14154 Washington Univ., Seattle.
FREQUENCY-SHAPED ESTIMATION AND ROBUST CONTROLLER DESIGN FOR AIRCRAFT FLIGHT CONTROL IN WIND DISTURBANCES Ph.D. Thesis
Byung Kyo Kim 1983 131 p
Avail: Univ. Microfilms Order No. DA8319422

Autoland flight control systems designed to maintain airspeed in the presence of wind shear tend to have large bandwidth which admits significant amounts of noise from wind turbulence through the airspeed measurement. This noise can produce unacceptable levels of control activity, particularly in thrust control. To improve this situation, a frequency-shaped optimal estimator algorithm by Gupta has been reformulated to provide smooth wind state information to the flight control system. It is shown that the measurement noise shaping function generates transmission zeros which can be used to introduce lag compensators in the estimators. This property of the frequency shaped estimator is useful in attenuating high frequency wind disturbance effects on the flight control system while maintaining transient response. A simple method has been developed for selection of shaping functions which both improve disturbance attenuation and also improve other system robustness measures such as stability margins and parameter insensitivity. Dissert. Abstr.

N84-14155 Texas Univ., Austin.
SUPPRESSION OF INTERFERENCE FLUTTER BY COMPOSITE TAILORING Ph.D. Thesis
T. N. Bakthavathsalam 1983 120 p
Avail: Univ. Microfilms Order No. DA8319557

The composite tailoring aspect of design and analysis for suppression of interference flutter is considered. The tail spar is designed to have a washout deflection shape under loads while matching the stiffness of the composite spar with that of the original aluminum spar. To get the maximum washout effect and also to have the matched stiffness, optimization techniques are employed. This washout design increases the flutter margin by about 6%. The tail is inherently very rigid and the bending deflections are small as is the controlled rotation (washout) which is coupled to this deflection. The bending stiffness of the tail spar is reduced by about 33% and an analysis is attempted. For this tail spar with washout design, the flutter margin improved to about 12%. In yet another study, the tail spar is made of aluminum and the wing spar is of composite construction with matched stiffness and with washin design features. This combination yields an appreciable increase of 37% in flutter margin. Tailoring the wing proved to be the most ideal way to control the downwash field that causes the interference flutter. Dissert. Abstr.

N84-14156 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
REDUCED STABILITY IN A MODERN COMMERCIAL AIRCRAFT AND CENTER OF GRAVITY CONTROL [VERWIRKLICHUNG REDUZIERTER STABILITAET IN EINEM MODERNEN VERKEHRSFLUGZEUG DURCH SCHWERPUNKTSREGELUNG]
A. Kroeger 1982 33 p refs In GERMAN Presented at DGLR Symp. Leistungssteigerungen bei Flaechenflugzeugen, Frankfurt am Main, 11-12 Nov. 1982
(MBB-UT-22-82-Oe; DGLR-82-092) Avail: Issuing Activity

The reduction of commercial aircraft stability was investigated. The reduction of the total drag by redistribution of the buoyancy on elevator units and wings leads to reduced static stability. Ways in which a given commercial aircraft can make use of the advantage of drag saving by applying a trim tank system, and improving stability by slight modifications to the automatic flight control system are described. Author (ESA)

N84-14157*# National Aeronautics ana Space Administration. Ames Research Center, Moffett Field, Calif.
DESIGN IMPLICATIONS FROM AFTI/F-16 FLIGHT TEST Final Report
Stephen D. Ishmael, Victoria A. Regenie, and Dale A. Mackall Jan. 1984 13 p refs Presented at IEE/AIAA 5th Digital Avionics Systems Conf., Seattle, 31 Oct. - 3 Nov. 1983
(NASA-TM-86026; H-1213; NAS 1.15:86026) Avail: NTIS HC A02/MF A01 CSCL 01C

Advanced fighter technologies are evolving into highly complex systems. Flight controls are being integrated with advanced avionics to achieve a total system. The advanced fighter technology integration (AFTI) F-16 aircraft is an example of a highly complex digital flight control system integrated with advanced avionics and cockpit. The architecture of these new systems involves several general issues. The use of dissimilar backup modes if the primary system fails requires the designer to trade off system simplicity and capability. This tradeoff is evident in the AFTI/F-16 aircraft with its limited stability and fly-by-wire digital flight control systems. In case of a generic software failure, the backup or normal mode must provide equivalent envelope protection during the transition to degraded flight control. The complexity of systems like the AFTI/F-16 system defines a second design issue, which can be divided into two segments: the effect on testing, and the pilot's ability to act correctly in the limited time available for cockpit decisions. The large matrix of states possible with the AFTI/F-16 flight control system illustrates the difficulty of both testing the system and choosing real-time pilot actions. B.W.

N84-14158*# Systems Technology, Inc., Hawthorne, Calif.
SPACE SHUTTLE FLYING QUALITIES AND FLIGHT CONTROL SYSTEM ASSESSMENT STUDY, PHASE 2 Final Contractor Report
T. T. Myers, D. E. Johnston, and D. T. McRuer Dec. 1983 195 p refs
(Contract NAS4-2940)
(NASA-CR-170406; NAS 1.26:170406; Rept-1187-1R) Avail: NTIS HC A09/MF A01 CSCL 01C

A program of flying qualities experiments as part of the Orbiter Experiments Program (OEX) is defined. Phase 1, published as CR-170391, reviewed flying qualities criteria and shuttle data. The review of applicable experimental and shuttle data to further define the OEX plan is continued. An unconventional feature of this approach is the use of pilot strategy model identification to relate flight and simulator results. Instrumentation, software, and data analysis techniques for pilot model measurements are examined. The relationship between shuttle characteristics and superaugmented aircraft is established. STS flights 1 through 4 are reviewed from the point of view of flying qualities. A preliminary plan for a coordinated program of inflight and simulator research is presented. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

No abstracts in this category.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-14159# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE, NO. 25
14 Dec. 1983 129 p Transl. into ENGLISH from various Russian articles
(JPRS-84946) Avail: NTIS HC A07

Progress in USSR aerospace sciences is reported. Topics discussed include: manned mission highlights, interplanetary sciences, life sciences, space applications, space policy and administration, and a launch table. For individual titles, see N84-14160 through N84-14168.

N84-14160# Joint Publications Research Service, Arlington, Va.
MANNED FLIGHT CHRONOLOGY
In its USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 1-3 Transl. into ENGLISH of editorial report from Soviet News Agency TASS (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

Information on activities connected with manned spaceflight activities are reported. Activities included: unlocking of Cosmos 1443; redocking of Soyuz T-9; docking of Progress-17; landing of Cosmos-1443 returncraft; Black Sea experiment; undocking of Progress-17; destructive reentry of Progress-17; destructive reentry of Cosmos-1443; and 8,250 revolutions. E.A.K.

N84-14161# Joint Publications Research Service, Arlington, Va.
KRASNAYA ZVEZDA ON ADVANTAGES OF COSMOS-1443 MODULAR SPACECRAFT
M. Rebrov *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 4-7 Transl. into ENGLISH from Krasnaya Zvezda (USSR), 2 Jul. 1983 p 6 (For primary document see N84-14159 05-12)
Avail: NTIS HC A07

The design, construction, and functions of the Cosmos-1443 modular spacecraft are described. The docking of Cosmos with Salyut-7, and its function as a freight deloverer is reported. E.A.K.

N84-14162# Joint Publications Research Service, Arlington, Va.
COSMONAUTS USE NEW INSTRUMENTS FOR EARTH STUDY c43
A. Ivakhnov *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 13-15 Transl. into ENGLISH from Izv. (Moscow), 18 Jul. 1983 p 2 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

Tests performed onboard the space station, for Earth observation are described. The eqipment, cameras and spectrometers, the spectrometer-camera, are outlined. E.A.K.

N84-14163# Joint Publications Research Service, Arlington, Va.
ELEKTROTOPOGRAF EXPERIMENT ON SALYUT-7
V. Petrenko *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 19-20 Transl. into ENGLISH from Pravda Ukr. (Kiev), 11 Aug. 1983 p 1 (For primary document see N84-14159 05-12)
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Research conducted onboard the Salyut-7, Soyuz T-9, Cosmos-1443 orbital complex is described. The electrotopography technological experiment showed irregularities in the electric field. A new method which records the microdefects in various dielectric materials is presented. E.A.K.

N84-14164# Joint Publications Research Service, Arlington, Va.
OCEAN COLOR STUDIES FROM SALYUT-7 c48
Vadim Kozhevnikov *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 21 Transl. into ENGLISH from Pravda (Moscow), 26 Aug. 1983 p 3 (For primary document see N84-14159 05-12)
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Optical properties of ocean colors in the visible part of the spectrum were studied. The systems of the major currents, the boundaries of elevations and depressions in the water, and the outflow of suspended materials in the world's largest rivers are characterized. The variability in ocean characteristics is significant,

for ocean sailing and the recovery of minerals from the ocean.
E.A.K.

N84-14165# Joint Publications Research Service, Arlington, Va.
FUNDAMENTAL ASTROMETRY TODAY AND TOMORROW
c89
M. S. Zverev *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 41-47 Transl. into ENGLISH from Zemlya i Vslennaya (Moscow), no. 3, May - Jun. 1983 p 16-21 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

Astrometry, which is the oldest branch of astronomy, studies the geometric and kinetic characteristics of heavenly bodies by precise measurements, is discussed. A knowledge of the precise locations, distances to, shapes and sizes of heavenly bodies, and their motions, is necessary for all types of astronomy and for many applied problems in geodesy, geophysics and space research. Fundamental astrometry supports all this work with a unified system of celestial coordinates. E.A.K.

N84-14166# Joint Publications Research Service, Arlington, Va.
THE 5TH SYMPOSIUM ON GRAVITATIONAL PHYSIOLOGY
c52
In its USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 82-84 Transl. into ENGLISH from Med. (Moscow), 27 Jul. 1983 p 3 Symp. held in Moscow; sponsored by the International Union of Physiological Sciences (For primary document see N84-14159 05-12)
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Gravitational physiology and a wide range of problems for aerospace environments were discussed. The effect of gravitational loads and their changes on base mechanisms which determine the origin, development and sustaining of vital functions; gravitational effects in different systems of a living organism; physiological, biological and morphological manifestations of the effect of weightlessness and its modeling; and theoretical approaches and real means of correction of disruptions caused by changes in gravitational loads are outlined. E.A.K.

N84-14167# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING OF THE EARTH AND AGRICULTURE c43
G. I. Belchanskiy *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 87-95 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 3, May. - Jun. 1983 p 27-32 (For primary document see N84-14159 05-12)
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The improvement of the effectiveness of agricultural production which requires a substantial improvement in planning and control methods is discussed. Modern remote sensing methods which study and monitor the state of agricultural resources make an important contribution to this task. E.A.K.

N84-14168# Joint Publications Research Service, Arlington, Va.
AVDUYEVSKIY ON ACCOMPLISHMENTS AND PROSPECTS OF COSMONAUTICS
V. S. Avduyevskiy *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 2-8 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 3, May - Jun. 1983 p 2-8 (For primary document see N84-14159 05-12)
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The use of space technology was reviewed. The execution of the assigned tasks were evaluated. Its applicability to the development of science, economics, and technology is enumerated.
Author

N84-14169# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, NO. 169
13 Dec. 1983 49 p Transl. into ENGLISH from various West European articles
(JPRS-84936) Avail: NTIS HC A03

Advanced materials, aerospace, the automobile industry, biotechnology, computers, microelectronics, and scientific and industrial policy activities are summarized. For individual titles, see N84-14170 through N84-14171.

N84-14170# Joint Publications Research Service, Arlington, Va.
HIGH COST, LACK OF INTEREST, MONEY FOR SPACELAB LAUNCHES
Goetz Wange *In its* West Europe Rept.: Sci. and Technol. No. 169 (JPRS-84936) 13 Dec. 1983 p 5-6 Transl. into ENGLISH from Flug Rev. (Stuttgart), Nov. 1983 p 22 (For primary document see N84-14169 05-12)
Avail: NTIS HC A03

Financial burdens imposed by ESA activities are sketched.
N.W.

N84-14171# Joint Publications Research Service, Arlington, Va.
DANISH CRYSTAL-GROWTH EXPERIMENT ABOARD SPACELAB
Michael Eastrup Smith *In its* West Europe Rept.: Sci. and Technol. No. 169 (JPRS-84936) 13 Dec. 1983 p 7-9 Transl. into ENGLISH from Berlingske Tidende (Denmark), 10 Nov. 1983 p 6 (For primary document see N84-14169 05-12)
Avail: NTIS HC A03

Danish crystal cultivation experiments on Spacelab are sketched. N.W.

N84-14172# European Space Agency, Paris (France).
ACTIVE EXPERIMENTS IN SPACE
W. R. Burke, comp. Jul. 1983 390 p refs Proc. of Intern. Symp., Alpbach, Austria, 24-28 May 1983
(ESA-SP-195; ISSN-0379-6566) Avail: NTIS HC A17/MF A01

Wave injections into the ionosphere from the ground and from space vehicles; ionospheric heating; diagnostics and modification of the ionosphere and magnetosphere by electron beams; beam plasma discharge; dynamics of quasi-neutral beams; critical ionization velocity; ionospheric modification; ion tracing in solar wind and magnetosphere; and plasma confinement and interactions were discussed. For individual titles, see N84-14173 through N84-14223.

N84-14173*# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
VLF WAVE INJECTIONS FROM THE GROUND c32
R. A. Helliwell *In* ESA Active Expts. in Space Jul. 1983 p 3-9 refs (For primary document see N84-14172 05-12)
(Grants NGL-05-020-008; NSF DPP-80-22282; NSF DPP-80-22540)
Avail: NTIS HC A17/MF A01 CSCL 17B

Experiments on wave-particle interactions using VLF whistler-mode waves injected into the magnetosphere from Antartica are described. The injected signals are single-frequency coherent waves whose amplitudes and frequencies may be changed slowly with time, or else two or more coherent wave trains transmitted simultaneously to determine the nature of the response to multifrequency excitation. The waves may be amplified 30 dB or more and may trigger intense emissions having bandwidths that vary from a few to several hundred Hertz. In most cases significant growth and triggering occur only when the driving signal is essentially monochromatic (bandwidth < 10 Hz). If two frequencies are transmitted simultaneously the signal at the lower frequency tends to be suppressed by 20 dB or more. These results are interpreted in terms of a feedback interaction between the waves and counter-streaming cyclotron resonant electrons in a region several hundred wavelengths long, centered on the magnetic equator. Author (ESA)

N84-14174# Science Applications, Inc., McLean, Va.
REVIEW OF IONOSPHERIC VLF AND ELF GENERATION c32
K. Papadopoulos (Maryland Univ., College Park), K. Ko (Princeton Univ., N.J.), A. Rieman (Indian Inst. of Tech., New Delhi), and V. Tripathi *In* ESA Active Expts. in Space Jul. 1983 p 11-28 refs (For primary document see N84-14172 05-12)
(Contract N00014-83-C-2019)
Avail: NTIS HC A17/MF A01

Modulation of the auroral electrojet current by large HF heaters, and stimulated nonlinear coupling of two HF wave packets with frequency difference equal to the desired VLF/ELF frequency are discussed. A concept which can produce down conversion efficiency in excess of the Manley-Rowe relations is reviewed. Results for VLF generation by collisionless interaction are disappointing since extremely high electric fields are needed in the interaction region to overcome the HF pump decay threshold. If no resonant enhancement of the field occurs in the interaction region, the effective radiative power (ERP) required is 1 to 10 million MW. Such a peak power requirement of 1 to 10 msec duration is beyond the capability of any present pulsed power systems. The ELF wave generation in the semicollisional regime is more promising, due to the lower group velocity of the ELF wave. The threshold field lies in the range 10 to 15 V/M for a frequency of 100 Hz. Author (ESA)

N84-14175# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
RESULTS FROM WAVE INJECTION EXPERIMENTS ON THE PORCUPINE ROCKET c32
R. Pottelette (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), L. R. O. Storey, and J. Thiel (Groupe de Recherches sur l'Energetique des Milieux Ionises) *In* ESA Active Expts. in Space Jul. 1983 p 29-34 refs Sponsored by CNES (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

During the Porcupine experiment devoted to the study of the acceleration processes of auroral particles, two rockets carried medium frequency range, and high frequency range active wave experiments. The medium frequency experiment measured the field-aligned drift velocity of thermal electrons, from the resulting nonreciprocal shift of the lower oblique resonance. However, the data exhibited frequency shifts much larger than expected, which varied cyclically as the payload spun. The high frequency experiment measured electron density and temperature. Results show that the amplitudes of the waves excited at the three half-harmonics of the electron gyrofrequency can be even stronger than those observed at the characteristic resonances of the plasma.
Author (ESA)

N84-14176# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
OBSERVATION OF WAVES INDUCED BY AN ARTIFICIAL ION BEAM IN THE IONOSPHERE c32
J. P. Lebreton, R. Pottelette (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), O. H. Bauer (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), J. M. Illiano (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), R. Treuman (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), and D. Jones (British Antartic Survey) *In* ESA Active Expts. in Space Jul. 1983 p 35-38 refs Sponsored by DFVLR and CNES (For primary document see N84-14172 05-12)
(Contract BMFT-Ref-01D0074A; BMFT-BV-14-B7-74)
Avail: NTIS HC A17/MF A01

The characterization of electrostatic waves was studied during the injection into the auroral zones of an ion beam in a direction quasiperpendicular to the magnetic field. The Xenon plasma source was situated on a small ejectable rocket payload and the wave measurements were recorded on the central payload when the separation distance was increasing. At short distances, H+ cyclotron waves with intensity peaking in the vicinity of the LHR frequency of a Xe+ dominated plasma are detected in front of the beam. In regions of large density gradients, situated in the leading edge of the beam, HF turbulence correlated with LF turbulence around and below the LHR is present. At large distances another type of HF and LF turbulence appears to be correlated with the formation of a density dip in front of the beam.
Author (ESA)

N84-14177# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ACTIVE SOUNDER EXPERIMENTS ON GEOS AND ISEE c15
J. Etcheto, G. Belmont, P. Canu, and J. G. Trotignon (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France) *In* ESA Active Expts. in Space Jul. 1983 p 39-46 refs (For primary document see N84-14172 05-12)
(Contract CNES-214)
Avail: NTIS HC A17/MF A01

Relaxation sounders launched on GEOS 1 and 2 and ISEE 1 satellites studied the propagation of waves in the Bernstein modes. Resonance signals are observed at frequencies at which waves propagate in the plasma with a low group velocity, in particular at fq frequencies. It is shown that the observations cannot be interpreted without taking into account the fact that the plasma is not maxwellian, but is made of several populations of different densities and temperatures. The coldest, and usually dominant population, produces a series of fq resonances which is clearly identified and enables the sounder to diagnose reliably this population. Additional resonances, created by the hot part of the plasma, are also observed and interpreted using the dispersion relation of the waves in a plasma with one or two hot components. Author (ESA)

N84-14178# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
SUMMARY OF IONOSPHERIC HEATING EXPERIMENTS AT TROMSOE (NORWAY) c46
P. Stubbe and H. Kopka *In* ESA Active Expts. in Space Jul. 1983 p 47-50 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Experiments with an ionospheric heating facility which generates a CW power of up to 1.5 MW in the frequency range 2.5 to 8 MHz are summarized. Antenna gain is 24 dBi (relative to isotropic antenna), corresponding to a beam width of 14.5 deg or a maximum effective radiated power of 360 MW. Modulation of the polar electrojet at ELF and VLF; D region modification; generation of artificial micropulsations; VHF backscatter from E region irregularities; and HF backscatter from F region striations are described. Anomalous absorption of HF waves; phase changes of a diagnostic HF wave; large scale field aligned irregularities; plasma and ion line irregularities with EISCAT; and stimulated electromagnetic emission of the ionospheric plasma are treated. Airglow modification; F region cross modulation; and in situ measurements in the modified F region are discussed. Author (ESA)

N84-14179# Uppsala Ionospheric Observatory (Sweden).
OBSERVATIONS OF STIMULATED ELECTROMAGNETIC EMISSIONS DURING IONOSPHERIC HEATING EXPERIMENTS c46
B. Thide, Aa. Hedberg, H. Derblom, R. Bostroem, P. Stubbe (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and H. Kopka (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Active Expts. in Space Jul. 1983 p 51-52 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

During ionospheric heating experiments, electromagnetic emissions were directly recorded by a ground based radio receiver/spectrum analyzer system in order to study electromagnetic decay products and high frequency electrostatic waves which, in the presence of plasma density gradients or otherwise, undergo a mode conversion to secondary electromagnetic waves of mainly the same frequency which then can propagate from the ionosphere to the ground. This diagnostic technique does not suffer from the constraints of the incoherent scatter method, and it constitutes a valuable complement to the latter as it can exhibit the full spectrum of many of the decay products, and is experimentally considerably simpler. Results show that under certain conditions the intensity builds up during the first few hundred msec after the heating pump wave is switched on. The amplitude then decreases, but increases again for a few hundred msec when the pump wave is switched off. Author (ESA)

N84-14180# Arecibo Ionospheric Observatory, Puerto Rico.
THE HF-ENHANCED PLASMA LINE c32

J. A. Fejer, C. A. Gonzales, H. M. Ierkic, M. Sulzer, F. T. Djuth (Aerospace Corp., Los Angeles), L. M. Duncan (LASL, N. Mex.), and J. P. Sheerin (Iowa Univ., Iowa City) *In* ESA Active Expts. in Space Jul. 1983 p 53-60 refs Sponsored by NSF (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Radar detection of the ion acoustic and Langmuir waves of the parametric decay instability, of the density irregularities and Langmuir waves of the oscillating two-stream instability, and of the waves associated with parametric instabilities excited by two pumps are described. A 430 and 46.8 MHz radar were used. Certain spectra are well explained by saturation theories; others can be explained only by propagation of Langmuir waves in irregularities. Agreement with the theory is particularly convincing for the existence of the growing mode and the arithmetic mean mode, and saturation through cascading. In other cases, such as the temporal changes in the nature of the spectrum and in the height of the high frequency plasma line, agreement with theory is only qualitative. Aspects such as the presence or absence of the miniovershoot, are not understood at all. Author (ESA)

N84-14181# Academy of Sciences (USSR), Moscow. Space Research Inst.
PLASMA PARTICLE ACCELERATION DUE TO EMISSION OF GROUND-BASED AND ONBOARD TRANSMITTERS c75
A. P. Babaev, S. B. Lyakhov, G. G. Managadze, A. A. Martinson, and P. P. Timofeev *In* ESA Active Expts. in Space Jul. 1983 p 61-65 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Results of experiments on radio wave interaction with the ionosphere and artificially injected plasma are reported. Experimental techniques and diagnostic equipment are described. In ground-based experiments airglow of oxygen and sodium during transmitter operation was investigated. The observed glow was connected with particle acceleration in the F layer and particle heating in the E layer. In the latter case the sodium glow has a pulsating character correlated with short transmitter pulses. In a rocket experiment, accelerated particles were detected during the interaction of the telemetry transmitter radiation with the artificial lithium plasma. Possible mechanisms responsible for the phenomena observed in experiments are considered. The energy relationships for particle acceleration are estimated. Author (ESA)

N84-14182# Academy of Sciences (USSR), Gorky. Inst. of Applied Physics.
ALFVEN MASERS c36
V. Yu. Trakhtengerts *In* ESA Active Expts. in Space Jul. 1983 p 67-74 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Alfven maser (AM) generation is investigated from the point of view of active experiments in cosmos. The theory of fundamental regimes of AM operation is presented. These regimes are characterized by different forms of time modulation of the Alfven and the whistler wave intensity and of the precipitating particle flux. The most effective ways of stimulating AM operation are based on the dependence of different AM generation regimes on ionospheric parameters which can be changed by the radiation of high power HF transmitters. Possible experiments on AM stimulation are discussed. Author (ESA)

N84-14183# Norwegian Defence Research Establishment, Kjeller.
PRELIMINARY RESULTS FROM THE HEATING ROCKET (HERO) PROJECT: IN SITU MEASUREMENTS OF IONOSPHERIC MODIFICATIONS USING SOUNDING ROCKETS c46
B. Grandal, G. Rose (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), J. Holtet (Oslo Univ.), K. Maaseide (Oslo Univ.), E. Neske (Inst. fuer Physikalische Messtechnik), W. Ott (Inst. fuer Physikalische Messtechnik), K. Spenner (Inst. fuer Physikalische Messtechnik), J. Troeim, H. Kopka (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and P. Stubbe (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Active Expts. in Space Jul. 1983 p 75-80 refs Sponsored by DFVLR and Royal Norwegian Council for Scientific and Industrial Research (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

In situ measurements of the plasma waves generated in an ionospheric modification experiment were made by four instrumented payloads on sounding rockets. The payloads flew through a sunlit atmosphere and observed F layer modifications, in particular electron plasma waves, near the reflection level of the heating wave. Examples of the observed effects are presented. Author (ESA)

N84-14184# Regis Coll., Weston, Mass.
IONOSPHERIC IRREGULARITIES AND GEOMAGNETIC FIELD FLUCTUATIONS DUE TO IONOSPHERIC HEATING c46
M. C. Lee and S. P. Kuo (Polytechnic Inst. of New York, Farmingdale) *In* ESA Active Expts. in Space Jul. 1983 p 81-89 refs (For primary document see N84-14172 05-12)
(Contract F19628-83-K-0024; Grant NSF ATM-81-114427)
Avail: NTIS HC A17/MF A01

Mechanisms of exciting ionospheric irregularities only, and the mechanism(s) of exciting both ionospheric irregularities and geomagnetic field fluctuations are discussed. A parametric instability excited directly by o-mode pump waves, and parametric instability excited by the Langmuir pump waves in the saturation spectrum of parametric decay instabilities are considered. Ionospheric irregularities and geomagnetic field fluctuations can be excited simultaneously by the filamentation instability of either o-mode or x-mode pump waves. Significant geomagnetic field fluctuations are found to be associated with the large scale modes of the instability. Author (ESA)

N84-14185# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
THE ELECTRON AND ION SPECTRA OF RADAR RETURNS FROM THE CRITICAL HEIGHT DURING IONOSPHERIC HEATING EXPERIMENTS c46
H. Kohl, C. LaHoz (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), K. Folkestad (EISCAT, Ramfjordbotn, Norway), T. Hansen (EISCAT, Ramfjordbotn, Norway), H. Kopka, G. Rosa, and P. Stubbe *In* ESA Active Expts. in Space Jul. 1983 p 91-97 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

The EISCAT radar was employed to diagnose the ionosphere perturbed by heating. The electronic component of the spectrum was measured and simultaneous measurements of the ionic component were also obtained, both from the critical height. It is possible to study all the waves excited by parametric as well as modulational instabilities involving Langmuir plasma and ion acoustic waves. A highly nonstationary state is observed along with strong asymmetries in spectrum shape and intensity. Often the oscillating two stream instability is on a par with the decay instability or even dominant. Occasionally the Langmuir wave at fHF-fia is absent, but the one at fHF-3fia can then be excited to a high level. The possibility of exciting modulational instabilities, and consequently the appearance of solitons and cavitons, is discussed. Author (ESA)

N84-14186# Academy of Sciences (USSR), Moscow. Inst. of Earth Physics.
STRONG ACOUSTIC WAVE ACTION c71
M. B. Gokhberg *In* ESA Active Expts. in Space Jul. 1983 p 99-110 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Experiments devoted to acoustic action on the atmosphere-magnetosphere-ionosphere system using ground based strong explosions are reviewed. The propagation of acoustic waves was observed by ground observations over 2000 km in horizontal direction and to an altitude of 200 km. Magnetic variations up to 100 nT were detected by ARIEL-3 satellite near the epicenter of the explosion connected with the formation of strong field aligned currents in the magnetosphere. The enhancement of VLF emission at 800 km altitude is observed. Author (ESA)

N84-14187*# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

FAST MAGNETOSPHERIC ECHOES OF ENERGETIC ELECTRON BEAMS **c46**

Klaus Wilhelm, William Bernstein (Rice Univ.), Paul J. Kellogg (Minnesota Univ., Minneapolis), and Brian A. Whalen (National Research Council of Canada, Ottawa) *In* ESA Active Expts. in Space Jul. 1983 p 113-120 refs Sponsored by NASA, the National Research Council (NRC) and DFVLR (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01 CSCL 04A

Electron beam experiments using rocket-borne instrumentation confirmed earlier observations of fast magnetospheric echoes of artificially injected energetic electrons. A total of 234 echoes were observed in a pitch angle range from 9 to 110 deg at energies of 1.87 and 3.90 keV. Of these, 102 echoes could unambiguously be identified with known accelerator operations at 2, 4 or 8 keV energy and highest current levels resulting in the determination of transit times of typically 300 to 400 ms. In most cases, when echoes were present in both energy channels, the higher energy electrons led the lower energy ones by 50 to 70 ms. Adiabatic theory applied to these observations yields a reflection height of 3000 to 4000 km. The injection process is discussed as the strong beam-plasma interaction that occurred near the electron accelerator appears to be instrumental in generating the source of heated electrons required for successful echo detection. Author (ESA)

N84-14188# Norwegian Defence Research Establishment, Kjeller.

IONOSPHERIC MODIFICATION BY ELECTRON BEAMS. RESULTS FROM ELECTRON ACCELERATOR EXPERIMENTS ON ROCKETS IN NORWAY **c46**

Bernt N. Maehlum *In* ESA Active Expts. in Space Jul. 1983 p 121-127 refs (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01

An electron accelerator rocket program in the auroral zone, which includes four mother - daughter payloads is described. It studies ionospheric plasma modification by linear and nonlinear processes. The beam electrons can be scattered up to several tens of meters out of the beam within a few msec, and interesting ELF modulation of the natural HF radio noise level is generated when the beam propagates through the plasma. A significant amount of suprathermal electrons are found up to 100 m along the beam, and 10 to 15 m away from the beam. Author (ESA)

N84-14189# Norwegian Defence Research Establishment, Kjeller.

PLASMA HEATING GENERATED BY A ROCKET-BORNE ELECTRON ACCELERATOR **c75**

P. Ingsoey and M. Friedrich (Technische Univ., Graz) *In* ESA Active Expts. in Space Jul. 1983 p 129-136 refs (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01

Modification of the ionospheric plasma by a rocket-borne electron accelerator was studied as a function of altitude and beam current. The data were obtained between 120 and 193 km, and the beam current varied between 15 and 100 mA. Data from an electron temperature and an impedance probe indicate that beam plasma discharge (BPD) takes place. It is found that BPD is ignited when the beam current exceeds a critical current level, and the threshold current is shown to be a function of altitude. It follows a 1/p law. Author (ESA)

N84-14190# Academy of Sciences (USSR), Moscow. Inst. of Space Research.

ON THE STIMULATED PRECIPITATION OF ELECTRONS AND THE MECHANISM OF WAVE GENERATION IN THE WHISTLER RANGE IN THE ARAKS EXPERIMENT **c32**

K. I. Gringauz, N. M. Shutte, N. I. Izhovkina (Academy of Sciences (USSR), Troitsk), and S. A. Pulinets (Academy of Sciences (USSR), Troitsk) *In* ESA Active Expts. in Space Jul. 1983 p 137-140 refs (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01

During the flight of a rocket launched as part of the ARAKS program, bursts of precipitated electrons in the pauses between injected electron pulses and simultaneous bursts of emission in whistler range were observed. Above the rocket in a region up to 2000 km altitude these whistlers caused a pitch angle diffusion of quasi trapped ring current electrons and their precipitation. The decay of whistlers with the Brillouin-Mandelshtam backscattering and acoustic wave generation may occur in the frequency region below electron gyrofrequency. Whistlers due to this backscattering were received on the nose cone in the pauses between the downward injected electron pulses. Author (ESA)

N84-14191# Institute of Space and Astronautical Science, Tokyo (Japan).

HIGHLIGHTS OF THE ELECTRON BEAM EXPERIMENTS IN SPACE IN JAPAN **c75**

Nobuki Kawashima *In* ESA Active Expts. in Space Jul. 1983 p 141-149 refs (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01

Progress of the electron beam experiments in space onboard rockets and satellites in Japan is reviewed. In rocket experiments, it is pointed out that the floating probe does not always indicate the true floating potential. In a satellite experiment on board JIKIKEN (EXOS-B), the electron beam experiment is found very useful for diagnosing the plasma density in the magnetosphere. Nonlinear decay and wave-wave coupling are also observed. Author (ESA)

N84-14192# Academy of Sciences (USSR), Moscow. Inst. of Space Research.

BEAM PLASMA DISCHARGE AND SUPRATHERMAL ELECTRON TAILS **c75**

A. A. Galeev, R. Z. Sagdeev, V. D. Shapiro, and V. I. Shevchenko *In* ESA Active Expts. in Space Jul. 1983 p 151-155 refs (For primary document see N84-14172 05-12)

Avail: NTIS HC A17/MF A01

A mechanism for electron tail formation in beam plasma discharge is discussed. This mechanism is related to the modulational instability of beam-excited Langmuir oscillations. As a result of the instability the wave energy is transferred to small scales, while the absorption of short wave oscillations leads to the acceleration of resonant electrons and formation of the tail of the electron distribution function. The results of 1D numerical simulations as well as the simple scaling laws for tail parameters are presented. Author (ESA)

N84-14193*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.

A SECOND KIND OF BEAM-PLASMA DISCHARGE (BPD): ROCKET AND LABORATORY RESULTS **c75**

Paul J. Kellogg and Steven J. Monson *In* ESA Active Expts. in Space Jul. 1983 p 157-159 refs (For primary document see N84-14172 05-12)

(Grant NsG-5373; Contracts NA79RA-C-00051; NOAA-03-78-BO1-60)

Avail: NTIS HC A17/MF A01 CSCL 20I

It is shown that there are two types of beam plasma discharge observed in rocket shots. The second BPD transition (BPD2) is characterized by a very broad featureless emission extending from much less than the cyclotron frequency to several times the plasma frequency. The characteristic spectra observed close to the beam plasma discharge region are deformed by the intervening plasma when observations are made at a distance from the injection field line and lead to spectra which must be interpreted with care. In one case, the Bernstein mode at 2 fce seems to be a remnant of the broad, featureless spectrum of BPD2. Author (ESA)

N84-14194# Academy of Sciences (USSR), Moscow. Inst. of Space Research.

PLASMA PROCESSES IN THE REGION OF ELECTRON BEAM INJECTION FROM A HIGH ALTITUDE PAYLOAD **c75**

G. G. Managadze, W. Riedler (Technische Univ. Graz), B. M. Balebanov, M. Friedrich (Technische Univ. Graz), T. I. Gagua, Z. Klos (Polish Academy of Sciences, Warsaw), N. A. Laliashvili (Georgian Academy of Sciences, USSR), N. A. Leonov (Kiev Univ.),

S. B. Lyakhov, A. A. Martinson et al *In* ESA Active Expts. in Space Jul. 1983 p 161-169 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Results of a rocket experiment to study beam-plasma interaction and the influence of plasma processes on payload neutralization are presented. Special features were high apogee, cleanliness of the payload surface, motor separation, and high gun current. Large scale discharge in the unperturbed atmosphere is observed below 160 km, leading to complete neutralization of the payload. In the beginning, local beam plasma discharge (BPD) is observed, which is attributed to electron beam interaction with payload outgassing. Local BPD in the vicinity of the payload does not result in payload neutralization at 450 km and the payload potential is of the order of the gun voltage. Above that height the payload potential considerably exceeds gun voltage. Possible mechanisms responsible for this effect are discussed. The results are compared with earlier rocket experiments and with data from laboratory modeling of BPD. Author (ESA)

N84-14195*# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
ELECTRON BEAM EXPERIMENTS ABOARD THE SPACE SHUTTLE c72
P. M. Banks, P. R. Williamson, W. J. Raitt (Utah State Univ., Logan), S. D. Shawhan (Iowa Univ., Iowa City), and G. Murphy (Iowa Univ., Iowa City) *In* ESA Active Expts. in Space Jul. 1983 p 171-175 refs (For primary document see N84-14172 05-12)
(Contracts NAS5-24455; NAS8-32807; Grant NAGW-235)
Avail: NTIS HC A17/MF A01 CSCL 20H

A 100 W, 0.1A electron gun was used in DC and pulsed modes in a series of vehicle charging and wave stimulation observations on a space shuttle. The results show that strong wave-electron scattering is present in most gun operations. It was possible to stimulate intense plasma waves in the ELF, VLF and HF frequency bands. Author (ESA)

N84-14196*# Rice Univ., Houston, Tex. Space Physics and Astronomy Dept.
OPTICAL MEASUREMENTS OF A LARGE-SCALE LABORATORY BEAM PLASMA DISCHARGE (BPD) c74
W. Bernstein, G. Mantjoukis, F. H. Leinbach (NOAA, Boulder, Colo.), and T. Hallinan (Alaska Univ., Fairbanks) *In* ESA Active Expts. in Space Jul. 1983 p 177-184 refs (For primary document see N84-14172 05-12)
(Grants NAGw-69; NSF ATM-80-22550)
Avail: NTIS HC A17/MF A01 CSCL 20F

Optical emission measurements provided information on the spatial distribution of energetic (primary and suprathermal) electrons producing the emissions; power dissipation during beam transit of the system; and modifications of the primary beam velocity distribution. The measurements were carried out for BPD's produced in a very large vacuum chamber using a 391.4 nm scanning photometer and total light (red sensitive) TV systems. Results for conditions Eb 500 to 2000 V, injection pitch angle 0 to 75 deg, and neutral density are presented. The typical power loss in ionization in transit of the 20 m pathlength during BPD is from 3 to 10% of the input power, an order of magnitude greater than attributable to collisional ionization alone. Differences between rocket observations and the laboratory results are noted. Author (ESA)

N84-14197# Institute of Space and Astronautical Science, Tokyo (Japan).
BEAM PLASMA DISCHARGE (BPD) EXPERIMENTS IN THE LABORATORY c75
N. Kawashima, S. Sasaki, K. Takahashi, and T. Obayashi *In* ESA Active Expts. in Space Jul. 1983 p 181-184 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

A laboratory experiment was performed to establish a general scaling law for the onset of the beam plasma discharge (BPD). The scaling law is different from Bernstein's. Though it is not possible to express the scaling law in a simple single form, a formula which governs the dominant region is proposed. The ionization phenomenon in the gun acceleration region strongly influences BPD onset. When differential pumping is not adopted so that the pressure in the gun acceleration region is kept at the same level as the one in the experimental region, the critical current drops 1/5. Unknown physical parameters may exist, for example, the beam diameter and the ratio of the beam diameter to the wall one. Author (ESA)

N84-14198*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INITIAL EXPERIMENTAL RESULTS FROM A LABORATORY SIZE BEAM PLASMA DISCHARGE DEVICE c75
A. Konradi, W. Bernstein (Rice Univ.), D. L. Bulgher (Rice Univ.), J. O. Garrity (Rice Univ.), and J. L. Winkler (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) *In* ESA Active Expts. in Space Jul. 1983 p 185-188 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

A laboratory beam plasma discharge (BPD) device produced BPD in N2, A, and He. All features of the BPD observed in the device agree with those observed in a large vacuum chamber. The empirical ignition criteria determined in the large chamber apply in the small device but do not fit when used for extrapolation between the large and the small geometry. At some energies and magnetic fields beam currents exist for which the total light output in the BPD state varies by < a factor of 2 with a factor of 6 pressure variation. Above 0.0001 torr the BPD width is pressure independent but for lower pressures it expands by as much as a factor of 4 at 0.00002 torr. Author (ESA)

N84-14199# Hulburt (E. O.) Center for Space Research, Washington, D.C. Space Plasma Diagnostics Group.
SUPRATHERMAL ELECTRON TAIL DISTRIBUTIONS IN A SPACE-SIMULATION BEAM PLASMA DISCHARGE c75
E. P. Szuszczewicz, D. N. Walker, H. R. Anderson (Science Applications Inc., Bellevue, Wash.), and K. Papadopoulos (Maryland Univ., College Park) *In* ESA Active Expts. in Space Jul. 1983 p 189-192 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Theoretical considerations identified wave-particle interactions and the subsequent generation of suprathermal electrons as the critical process in ignition of the beam plasma discharge (BPD). This interpretation is supported by measurements which find copious amounts of energized plasma electrons. This suprathermal population is confined to a region within 1 m of the beam center and is found to be highly dependent on radius. At the peak density level of the thermal plasma the suprathermal component is 20% of the total population, with an extrapolated energy distribution between 16 and 100 eV. Analysis of a threshold BPD condition suggests that primary ionizing electrons are in the 19 to 55 eV domain with the peak ion-pair-production rate near 23 eV. Author (ESA)

N84-14200# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
MODELING OF BEAM-PLASMA DISCHARGE IN THE LABORATORY c75
S. B. Lyakhov, A. D. Mayorov, G. G. Managadze, L. Yu. Kochmarev, E. G. Shustin, M. Friedrich (Technische Univ. Graz), W. Riedler (Technische Univ. Graz), Z. Klos (Polish Academy of Sciences, Warsaw), and N. A. Leonov (Kiev State Univ.) *In* ESA Active Expts. in Space Jul. 1983 p 193-196 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Experiments in which beam plasma discharge (BPD) with typical dimension of a few meters was studied are reviewed. The diagnostic set up was similar to that used in a rocket experiment. The ignition conditions for BPD were studied. Cross sections of the areas with intense formation of ions were measured under different conditions. The results are compared to those obtained from a BPD study in the unlimited ionospheric plasma in the rocket experiment Gruziya-60-SPURT. Author (ESA)

N84-14201# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
DYNAMICS OF QUASINEUTRAL BEAMS c75
R. Treuman, O. H. Bauer, G. Haerendel, and B. Haeusler *In* ESA Active Expts. in Space Jul. 1983 p 197-206 refs (For primary document see N84-14172 05-12)
(Contracts BMFT-Ref-01D0074A; BMFT-RV-14-B7-74)
Avail: NTIS HC A17/MF A01

Ion beam dynamics after injection into plasmas is reviewed for magnetized and unmagnetized plasmas. Quasineutral beams of infinite extension encountering a transverse magnetic field form a boundary layer. Anomalous dissipation has to be invoked for penetration into the field. In presence of an ambient plasma the beam can be neutralized by ambient electrons. For beams of finite cross section kinetic (shear) Alfven waves can be driven by the beam current or beam polarization electric field. These waves are stationary in the beam frame of reference and provoke field aligned electron current in the ambient plasma environment. Estimates for charge neutralization mechanism based on the waves are presented. It allows for penetration of the beam into the plasma but does not require current neutralization. Measurements of Xenon beam dynamics during the Porcupine experiment obtained with the main payload are discussed in the context of the model. Author (ESA)

N84-14202*# New Hampshire Univ., Durham.
PLASMA JET EFFECTS ON THE IONOSPHERIC PLASMA c75
T. E. Moore, R. L. Arnoldy, L. J. Cahill (Minnesota Univ., Minneapolis), and P. M. Kintner (Cornell Univ., Ithaca, N.Y.) *In* ESA Active Expts. in Space Jul. 1983 p 207-212 refs (For primary document see N84-14172 05-12)
(Grants NAG6-12; NAGw-52; NAG5-601; NAG6-11)
Avail: NTIS HC A17/MF A01 CSCL 20I

Heavy ion beams were injected into the ionospheric plasma (experiments ARCS 1 and ARCS 2). In ARCS 1, operation of a 25eV argon ion source, mounted on a plasma diagnostic payload, produced an accelerated electron population; broadband electric field turbulence; large, spin synchronized electric field perturbations; and depletions of thermal ions. In ARCS 2, the ion source was deployed upward along the local magnetic field direction away from the diagnostic payload, and observed effects are contained within several meters of the ion source. However, enhanced wave levels near the LHR frequency are observed at distances up to 1 km, as are the injected ions themselves. A measurement of the dominant wavelength of the enhanced waves is consistent with an inference based upon the accelerated electron population seen in ARCS 1. This electron population is not evident during ARCS 2. Author (ESA)

N84-14203# Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
CRITICAL VELOCITY EXPERIMENTS IN SPACE c90
E. Moebius *In* ESA Active Expts. in Space Jul. 1983 p 215-226 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Critical ionization velocity experiments in space are discussed. The high relative velocity of the neutral gas with respect to the ambient plasma is produced in three different ways. In one group of experiments gas jets with speeds of the order of 10 km/sec are produced by shaped charges with Ba or Sr. The second uses the high velocity of orbiting spacecraft; the third is based on the high flow velocities in the upper magnetosphere and the solar wind. The experiments show that the Townsend condition is the most critical restriction for fast gas jets and gas releases in the ionosphere while mass loading and diamagnetic effects are the main restrictions for releases in the flowing plasmas of the upper magnetosphere and the solar wind. Author (ESA)

N84-14204# Science Applications, Inc., McLean, Va.
THE SPACE SHUTTLE ENVIRONMENT AS EVIDENCE OF CRITICAL IONIZATION PHENOMENA c16
K. Papadopoulos (Maryland Univ., College Park) *In* ESA Active Expts. in Space Jul. 1983 p 227-244 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Critical ionization velocity (CIV) effects are proposed to explain observations of the space shuttle environment, including 10 to 100 kR optical emissions, strong IR emissions, enhanced wave activity and fluxes of energetic electrons and ions, despite the fact that the orbiter velocity is below the CIV for oxygen. Given that a small fraction of the ambient ions is reflected from the orbiter body, and consequently counterstreaming at a velocity of 16 km/sec with respect to the ionospheric plasma, it is possible for discharge ignition to occur in regions around the orbiter surface where the neutral density has values of the order of between 50 billion to 100 billion/cu cm. Observations indicate that this is a commonplace occurrence. The discharge is maintained in steady state by the flux of ambient ionospheric ions, which form a beam in the orbiter frame of reference. Author (ESA)

N84-14205# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
THE ROLE OF MOMENTUM TRANSFER TO THE AMBIENT PLASMA IN CRITICAL VELOCITY EXPERIMENTS c34
Gerhard Haerendel *In* ESA Active Expts. in Space Jul. 1983 p 245-247 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

The role of momentum injection in situations with critical velocity ionization is investigated. A measure of the effect of mass loading on the relative velocity of ions and neutrals is derived. High mass loading reduces it to a value close to critical velocity and thus lowers the free energy available for the process. Thereby an upper limit is imposed on the rate of ionization. If an efficient external source of ionization is competing, the critical velocity process may be suppressed altogether. Gas injection experiments in the ionosphere fall typically into the range of weak mass loading. Author (ESA)

N84-14206# Uppsala Ionospheric Observatory (Sweden).
EXPERIMENTAL AND THEORETICAL ASPECTS OF THE GENERATION OF MHD WAVES BY CHEMICAL RELEASES IN THE IONOSPHERE c75
Gunnar Holmgren *In* ESA Active Expts. in Space Jul. 1983 p 249-253 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Electrodynamic disturbances arising from chemical releases in the ionosphere are modelled in terms of electric circuits. It is concluded that it might be possible to create parallel current densities in the same, or higher, order of magnitude as the parallel current densities associated with natural auroral arcs, with the chemical release technique. Author (ESA)

N84-14207# Air Force Geophysics Lab., Hanscom AFB, Mass.
OVERVIEW OF PROJECT BRAZIL IONOSPHERIC MODIFICATION EXPERIMENT (BIME) c46
R. S. Narcisi *In* ESA Active Expts. in Space Jul. 1983 p 255-264 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Two ionospheric modification experiments were conducted to test theories for generating plasma instabilities in the equatorial ionosphere. Rocket-borne payloads with explosive releases of H2O, CO2 and N2 were detonated after sunset within the ionospheric f region ledge and created, via rapid neutral-plasma chemistry, a large-scale ionospheric depletion that may have initiated Rayleigh-Taylor instabilities. Rocket payloads with mass spectrometers and plasma probes launched following each release made measurements in the vicinity of the disturbances. Extensive ground-based and airborne systems provided supporting radio and optical measurements. Author (ESA)

N84-14208# Hulburt (E. O.) Center for Space Research, Washington, D.C. Space Plasma Diagnostic Group.
REAL-TIME IN-SITU TARGETING OF GEOPLASMA DOMAINS

FOR PURPOSES OF CHEMICAL INJECTION AND ARTIFICIAL TRIGGERING OF EQUATORIAL SPREAD-F c36
E. P. Szuszczewicz, D. N. Walker, J. C. Holmes, L. Kegley, M. Swinney, R. S. Narcisi (Air Force Geophysical Laboratory), J. Buchau, E. Trzcinski (Air Force Geophysical Laboratory), and B. Reinisch (Lowell Univ., Mass.) *In* ESA Active Expts. in Space Jul. 1983 p 265-269 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

A real-time in situ targeting capability was developed and applied in experiments designed to test the equatorial spread-F phenomenon. The system employed a rocket-borne payload carrying plasma instrumentation with a telemetry downlink to an online ground-based computer facility coupled to a real time uplink command line for chemical payload detonation. The system provided perfect positioning of each release relative to selected critical geoplasma domains. The experiment plan, launch criteria, and real-time system are presented and discussed in terms of numerical simulations which treat naturally occurring and chemically induced equatorial spread-F. Author (ESA)

N84-14209# Los Alamos Scientific Lab., N. Mex.
MODELING OF MODIFICATION EXPERIMENTS INVOLVING NEUTRAL GAS RELEASE c46
Paul Bernhardt *In* ESA Active Expts. in Space Jul. 1983 p 271-277 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Modeling of the neutral gas dynamics after injection, subsequent formation of ionosphere holes; and use of such holes as experimental tools are discussed. Exhaust flow from space shuttle engines is described using the results of gas dynamics theory. Condensation in rocket exhaust; collisional interaction with background atmosphere; and diffusive expansion are considered. High Beta dynamics of negative ions; and plasma holes and ionospheric heating are treated. Author (ESA)

N84-14210# National Research Council of Canada, Ottawa (Ontario). Herzberg Inst. of Astrophysics.
PROJECT WATERHOLE III c46
B. A. Whalen, A. W. Yau, A. G. Creutzberg, A. G. McNamara, F. R. Harris, R. L. Gattinger, D. D. Wallis, M. Pongratz (LASL, N. Mex.), P. Bernhardt (LASL, N. Mex.), P. Kintner (Cornell Univ., Ithaca, N.Y.) et al *In* ESA Active Expts. in Space Jul. 1983 p 279-283 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Holes were created in the F region by explosive releases of large quantities of water vapor, to test theories of the electrodynamic structure of auroral arcs. The water vapor releases created 50 km diameter holes in the ionosphere in and near structured premidnight auroral arcs. It was anticipated that these holes would interrupt or perturb the ionospheric current systems associated with the arcs and that this perturbation would in turn affect the acceleration mechanism responsible for the aurora. Results from the two rocket flights indicate that significant modifications of the energetic electron precipitation patterns are induced by the releases. Author (ESA)

N84-14211# Boston Univ., Mass. Dept. of Astronomy.
ROCKET EXHAUST EFFECTS AS ACTIVE SPACE PLASMA EXPERIMENTS OF OPPORTUNITY c46
M. Mendillo *In* ESA Active Expts. in Space Jul. 1983 p 285-292 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Examples of how photometer and wide-angle airglow imaging systems can be used to study diffusive and photochemical properties of the upper atmosphere are given. Incoherent scatter measurements of a large-scale ionospheric hole are shown to yield estimates of dynamical and chemical rate constants associated with the plasma perturbations themselsves. The Spacelab-2 series of shuttle engine burn experiments are summarized. Author (ESA)

N84-14212# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
COLORED BUBBLES: AN EXPERIMENT FOR TRIGGERING EQUATORIAL SPREAD F c46
G. Haerendel, O. H. Bauer, S. Cakir, H. Foeppl, E. Rieger, and A. Valenzuela *In* ESA Active Expts. in Space Jul. 1983 p 295-298 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Barium plasma clouds were released in the post-sunset F region of the equatorial ionosphere. The clouds were characteristically distorted and exhibited the formation of irregularities of various scales. Visible striations, radio wave scintillations, spread echoes on ionograms were noted. Bubble formation was not observed. The origin of distortions and irregularities is related to the combined action of the friction with the neutral constituents; the gravitational force; and the need for a divergence-free integrated transverse current. The latter aspect is identified as the origin of the shear flow in the (unperturbed) lower F region. Computer simulations of the plasma transport were used to evaluate the observed complex motions of the plasma clouds in terms of the forces mentioned. Author (ESA)

N84-14213# Air Force Geophysics Lab., Hanscom AFB, Mass.
PLASMA COMPOSITION AND STRUCTURE CHARACTERIZATION OF AN IONOSPHERIC BARIUM CLOUD c46
R. S. Narcisi and E. P. Szuszczewicz (Hulburt (E. O.) Center for Space Research, Washington, D.C.) *In* ESA Active Expts. in Space Jul. 1983 p 299-304 refs Sponsored by Defense Nuclear Agency, Office of Naval Research and AFOSR (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Composite in situ measurements of electron density, temperature, density fluctuations, and ion composition within an ionospheric barium cloud are reported. A peak Ba + ion concentration of 5 million/cu cm is observed at an altitude of 162 km where naturally-occurring NO+ and O+2 ions were eliminated by large recombination losses and the cloud electrons thermalize with the background ionosphere at a temperature of 1100 + or - 150 K. Observations of injected species included Ba++, and Ca+ (the latter being an impurity in the barium payload). The ion composition results provide evidence for the possible formation of an image cloud just below the Ba+ domain. On the top and bottomside regions of the cloud, density fluctuation power spectra show resonant short wavelength behavior with preliminary considerations supporting the unique observation of a multi-ion-acoustic wave process in an artificially disturbed ionospheric domain.
Author (ESA)

N84-14214*# Los Alamos Scientific Lab., N. Mex. Group Ess-8.
CREATING UNSTABLE VELOCITY-SPACE DISTRIBUTIONS WITH BARIUM INJECTIONS c46
Morris Pongratz *In* ESA Active Expts. in Space Jul. 1983 p 305-310 refs Sponsored by NASA Earth Science and Applications Div. and US Dept. of Energy (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01 CSCL 04A

Ion velocity-space distributions resulting from barium injections from orbiting spacecraft and shaped charges are discussed. Active experiments confirm that anomalous ionization processes may operate, but photoionization accounts for the production of the bulk of the barium ions. Pitch-angle diffusion and/or velocity-space diffusion may occur, but observations of barium ions moving upwards against gravity suggests that the ions retain a significant enough fraction of their initial perpendicular velocity to provide a mirror force. The barium ion plasmas should have a range of Alfven Mach numbers and plasma betas. Because the initial conditions can be predicted these active experiments should permit testing plasma instability hypotheses. Author (ESA)

N84-14215# National Research Council of Canada, Ottawa (Ontario). Hertzberg Inst. of Astrophysics.
SEQUENTIAL BARIUM RELEASES TO STUDY TANGENTIAL

VERSUS ROTATIONAL DISCONTINUITIES IN AURORAL ARCS c46

A. W. Yau, B. A. Whalen, F. Creutzberg, and R. L. Gattinger *In* ESA Active Expts. in Space Jul. 1983 p 313-315 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Project SABRE, a sounding rocket experiment using sequential barium thermite releases in the sunlit F region along an auroral arc to study the tangential electric field distribution near a nightside auroral arc, is described. The aim of SABRE is to measure the magnitude and variation of the tangential electric field along an auroral arc, at several spatial locations (separation distances much less than auroral arc width) and over typical durations of visible, structured auroral arcs. Results suggest that there is no strong ionospheric drift perpendicular to the auroral arc, in the frame of reference of the arc. Author (ESA)

N84-14216# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

THE ACTIVE MAGNETOSPHERIC PARTICLE TRACER EXPLORERS (AMPTE) PROGRAM c46

S. M. Krimigis, G. Haerendel (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), R. W. McEntire, G. Paschmann (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), and D. A. Bryant (Science Research Council, Chilton, England) *In* ESA Active Expts. in Space Jul. 1983 p 317-325 refs Sponsored by Maryland Univ., Lockheed Palo Alto Research Laboratories, California, TRW, Bundesministerium fuer Forschung und Technologie, Max-Planck Society, and UK Science and Engineering Research Council) (For primary document see N84-14172 05-12)
(Contract N00024-78-C-5384)
Avail: NTIS HC A17/MF A01

The Active Magnetospheric Particle Tracer Explorers (AMPTE) spacecraft carry out the release and monitoring of tracer ions (lithium and barium) in the solar wind and within the distant magnetosphere for studies of access of solar wind ions to the magnetosphere and the convective-diffusive transport and energization of magnetospheric particles. A single massive release of barium in the dawn magnetosheath creates an artificial comet in the flowing solar wind plasma within which diamagnetic effects, ionization, momentum exchange, ion transport and visible phenomena are studied. Comprehensive measurements of the composition and dynamics of the ambient Z > or = 2 magnetospheric particle populations at the geomagnetic equator, including the energy interval (20 to 200 keV) of importance to the ring current are proposed. Author (ESA)

N84-14217# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

ION COUPLING TO MAGNETOSHEATH BULK MOTION c46

Armando L. Brinca (Instituto Superior Tecnico, Lisbon) *In* ESA Active Expts. in Space Jul. 1983 p 327-335 refs Sponsored by Alexander von Humboldt Foundation (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Particle motion in a turbulent magnetoplasma was used to model ion propagation in the magnetosheath. Numerical integration of the force equation permits the efficiency of several turbulence types in achieving the coupling of the ion motion to the bulk plasma flow to be evaluated. The results obtained for a homogeneous medium show strong dependency on fluctuation characteristics. Observations of magnetosheath turbulence suggest that rapid coupling, i.e., ensemble average ion velocity approaching the bulk plasma velocity within a few gyroperiods, is an infrequent event. The implications of this situation for the AMPTE solar wind release are assessed. Author (ESA)

N84-14218# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

PLASMA CONFINEMENT AND INTERACTION EXPERIMENTS c75

Gerhard Haerendel *In* ESA Active Expts. in Space Jul. 1983 p 337-340 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

The diamagnetic and momentum coupling phases associated with the injection of lithium and barium gases into the weak magnetic fields of the solar wind and magnetospheric tail are described. Because of the high initial dynamic pressure of the expanding ionized components the diamagnetic effects are substantial. However, for the slowly ionizing lithium, only a small fraction of the total gas is contained in the diamagnetic cavity, whereas for barium this fraction is > 90%. The lifetime of the magnetic cavities is discussed in the light of microscopic and macroscopic instabilities. After a short initial period most of the injected lithium ions can be considered as single particles, picked up by the ambient plasma flow. This does not apply to the barium clouds. The momentum transfer takes a long time. Several hours may pass before the ambient convection speed is attained. Author (ESA)

N84-14219# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.

ACTIVE EXPERIMENTS AND SINGLE ION MOTION IN THE MAGNETOTAIL c46

P. L. Rothwell and G. K. Yates *In* ESA Active Expts. in Space Jul. 1983 p 341-345 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

Analytic solutions to the Lorentz equation which indicate that the magnetic field in the plasma sheet focuses selected ions from the plasma sheet boundaries on the neutral sheet are obtained. The kinetic energy of these ions usually exceeds the threshold energy required for the ion tearing mode instability. Two active experiments based on this effect are proposed. Heavy ions injected towards dusk on the plasma sheet boundary would become focused on the neutral sheet and perhaps trigger the ion tearing mode. A boundary perturbation, such as a thermal chemical release, that locally enhances the boundary turbulence level could be introduced, causing sufficient ksq = 1 ions to be focused on the neutral sheet to trigger the ion tearing mode. Author (ESA)

N84-14220# European Space Research and Technology Center, Noordwijk (Netherlands). Space Sciences Dept.

THE EXPERIMENT PHENOMENA INDUCED BY CHARGED PARTICLE BEAMS (PICPAB) ON BOARD SPACELAB 1 c72

C. Beghin (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), J. L. Michau (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), M. Pirre (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), L. Pomathiod (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), J. J. Berthelier (Centre de Recherche en Physique de l'Environnement Terrestre et Planetaire, Saint-Maur, France), J. P. Lebreton, and B. N. Maehlum (Norwegian Defence Research Establishment, Kjeller) *In* ESA Active Expt. in Space Jul. 1983 p 349-355 refs Sponsored by CNES, ESA and Norwegian Defence Research Establishment (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

A Spacelab experiment which studies the charging and neutralization processes, and interactions with local ionized and neutral atmosphere, caused by electron and ion beam injection into the ionosphere, is presented. Electron accelerators and vehicle charge neutralization are studied by monitoring the return currents and the potential differences between the accelerators, the vehicle and the plasma potential. During joint operations with the low light TV camera looking at 391.4 nm and H alpha lines, it is possible to visualize the beams and the returning flux, owing to charge exchange processes with surrounding neutral gas. Author (ESA)

N84-14221# Institute of Space and Astronautical Science, Tokyo (Japan).

SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC). SCIENCE PROBLEMS OF SEPAC/SPACELAB 1 MISSION c72

Tatsuzo Obayashi *In* ESA Active Expts. in Space Jul. 1983 p 357-359 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

The SEPAC/Spacelab-1 experiments on vehicle charge build up and its neutralization; beam plasma physics; and beam atmosphere interactions are summarized. The scientific instruments onboard Spacelab are: electron beam accelerator, magnetoplasmadynamic arcjet; and associated diagnostic equipment including a monitoring television camera. Wave excitation by electron beam antennas; plasma flow into a curved magnetic field; critical ionization velocity; and artificial aurora excitation are studied. Author (ESA)

N84-14222*# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
ELECTRODYNAMIC TETHER EXPERIMENTS IN THE IONOSPHERE c46
W. J. Raitt, P. M. Banks (Stanford Univ.), and P. R. Williamson (Stanford Univ.) *In* ESA Active Expts. in Space Jul. 1983 p 361-367 refs (For primary document see N84-14172 05-12) (Grant NAGw-235)
Avail: NTIS HC A17/MF A01 CSCL 04A

The physical concepts of the space shuttle-borne electrodynamic tether experiment are reviewed, and the engineering realization of the deployment system for the first electrodynamic tether system is described. Models of the mechanisms involved in closing the current loop ionosphere - collector - tether - shuttle - ionosphere are discussed in terms of measurements to verify the models. Application of the electrodynamic tether to power generation and wave stimulation is considered. The characteristics of the instrumentation required on the deployed collector and on the space shuttle are addressed, and the flight operations necessary to demonstrate the capabilities of the electrodynamic tether are treated. Author (ESA)

N84-14223*# TRW Space Technology Labs., Redondo Beach, Calif. Space Sciences Dept.
WAVES IN SPACE PLASMAS (WISP): A SPACE PLASMA LAB ACTIVE EXPERIMENT c75
R. W. Fredricks *In* ESA Active Expts. in Space Jul. 1983 p 369-375 refs (For primary document see N84-14172 05-12) (Contract NAS8-33971)
Avail: NTIS HC A17/MF A01 CSCL 20I

The Waves in Space Plasmas (WISP) series of Spacelab Space Plasma Labs devoted to active experimentation, are introduced. Space Plasma Lab-1 is keyed to active probing of the ionosphere and magnetosphere using controlled wave injections by the WISP VLF and HF transmitters, supported by a free-flying plasma diagnostics package instrumented with wave receivers and particle probe diagnostics, designed to measure radiation and propagation of plasma waves, precipitated particle fluxes due to wave/particle interactions, and similar phenomena resulting from wave injectons. The VLF transmitter delivers up to 1 kW of RF power into the antenna terminals over the range from 0.3 to 30 kHz. The HF transmitter delivers up to 500 W to the antenna over the range from 1 to 30 MHz. A dipole antenna commandable to any extension up to 300 m tip-to-tip is available. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-14224# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CLOSE APPROACHES BETWEEN SATELLITES IN CIRCULAR ORBITS
Thomas S. Seay 25 Aug. 1983 24 p
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A133779; TR-644; ESD-TR-83-022) Avail: NTIS HC A02/MF A01 CSCL 22/3

The variation in range between two satellites in different circular orbits is of interest in many space system problems. This report provides a simple expression for the range and presents an analysis of the frequency and duration of close approaches. The results are applied to a simple satellite search problem. Some relationships for the range rate are also given. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-14225# Space and Missile Test Center, Patrick AFB, Fla.
RANGE SAFETY DISPLAY SYSTEM UPGRADE Final Report
F. J. Bailey and T. J. Linder 16 Sep. 1983 14 p
(AD-A133789; ESMC-TR-83-08) Avail: NTIS HC A02/MF A01 CSCL 16/1

The paper discusses replacement of a monochromatic CRT system with a color graphics system. Range Safety's role in the Eastern Space and Missile Center's operations is to minimize the risks to life, health, and property from missile flight. The Range Safety Display System plays an important part in fulfilling this mission because the decision to allow a flight to continue, or to terminate it, is based primarily on the information presented in this display. The increasing complexity of launches has resulted in a corresponding increase in the amount and complexity of information that the Range Safety Officer must absorb in realtime. The existing monochromatic CRT displays are being replaced with a system consisting of more powerful host computers and both high- and medium-resolution color graphics displays. Significant enhancements include improved presentation of data by color, line style, and blink; easier software maintenance; expanded user control of displays; and off-loading many of the tasks now performed in the Central Computer Complex. Author (GRA)

N84-14226# Space and Missile Test Center, Patrick AFB, Fla.
EASTERN SPACE AND MISSILE CENTER (ESMC) CAPABILITY Final Report
S. R. Clark and F. Donald J. McLamb 16 Sep. 1983 25 p
(AD-A133788; ESMC-TR-83-06) Avail: NTIS HC A02/MF A01 CSCL 16/1

The Eastern Space and Missile Center's Eastern Test Range includes all stations, ships, sites, ocean areas, and airspace necessary to conduct missile and space vehicle test and evaluation. This paper discusses the major instrumentation systems for the Range and identifies salient instrumentation characteristics important in the support of test programs and in the collection of test data. Highlights of the many technical enhancements and capital plant improvements planned for the near future are also identified. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-14227 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
DEVELOPMENT, PRODUCTION AND TESTING OF THE PRIMARY STRUCTURE FOR THE SHUTTLE PALLET SATELLITE (SPAS-01) [ENTWICKLUNG, FERTIGUNG UND TEST DER PRIMAERSTRUKTUR FUER DEN SATELLITEN SPAS-01 (SHUTTLE PALLET SATELLITE)]
Hilmar Laube and Juergen Franz 1982 38 p refs In GERMAN Presented at DGLR Symp. Entwicklung u. Anwendung von

CFK-Strukt., Stuttgart, 26-27 May 1982
(MBB-UR-580-82-Oe) Avail: Issuing Activity

The SPAS system was developed for the use of the US Space Shuttle. It is a modular low cost platform system, and broadens the application domain of a shuttle mission. The cost reduction of the SPAS system is obtained by minimization of the starting costs by accomodation as payload disk inside the shuttle cargo bay; by a simple structure made of standardized node elements and shafts entailing high flexibility, simple integration and low expenses in the analytical verification; and by using existing secondary systems as positioning, power supply and data management. The structure is made of carbon struts and titanium node elements. The construction and manufacture of the carbon struts framework and the concomitant test program are described. The structural analyses for the SPAS-01 system verification are made with the program system NASTRAN. Author (ESA)

N84-14228*# National Aeronautics and Space Administration, Washington, D. C.
NUTATION DAMPER FOR THE AMPTE-IRM SATELLITE: FINAL REPORT
A. Truckenbrodt, B. Schultysik, and J. P. Mehltretter Apr. 1983 21 p Transl. into ENGLISH of the mono. "Nutationsdaepfer fuer den AMPTE-IRM Satelliten: Abschluebericht" (West Germany), Rept. no. TC-No.-017-Tru-Scho/sa, 9 Dec. 1982 20 p Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASw-3542; TC-No-017-Tru-Scho/Sa)
(NASA-TM-77330; NAS 1.15:77330) Avail: NTIS HC A02/MF A01 CSCL 22B

The design, computations, and testing of the nutation damper for the AMPTE-IRM satellite are described. The nutation motions of the satellite excite fluid oscillations in the closed tube system; kinetic energy is destroyed (converted to heat) through tube/fluid friction, constriction of the stream by cross sectional change, and formation of turbulence by stream enlargement. This energy is extracted from the satellite such that nutation is reduced. Tests were carried out in a pendulum testing device and the time constants were calculated. Findings showed that the damper remained within the originally specified values and provided for good dynamic behavior of the satellite. M.G.

N84-14229# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF THE SATELLITE KINEMATICS MODEL IN THE NAVAL WARFARE GAMING SYSTEM
Rex H. Shudde Sep. 1983 18 p
(AD-A134039; NPS55-83-022) Avail: NTIS HC A02/MF A01 CSCL 09/2

The satellite kinematics models in the Naval Wargaming System (NWGS) is described and critiqued. Suggestions are made for simplifying the existing computer code and for increasing the accuracy of the satellite simulation. Author (GRA)

N84-14177# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
ACTIVE SOUNDER EXPERIMENTS ON GEOS AND ISEE
J. Etcheto, G. Belmont, P. Canu, and J. G. Trotignon (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France) *In* ESA Active Expts. in Space Jul. 1983 p 39-46 refs (For primary document see N84-14172 05-12)
(Contract CNES-214)
Avail: NTIS HC A17/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-14230# Committee on Science and Technology (U. S. House).
FLIGHT OF STS-8 WITH ASTRONAUTS CAPTAIN RICHARD H. TRULY, COMMANDER DANIEL C. BRANDENSTEIN, LIEUTENANT COMMANDER DALE A. GARDNER, LIEUTENANT COLONEL GUION S. BLUFORD, JR. AND WILLIAM EDGAR THORNTON, M.D.
Washington GPO 1983 29 p Hearing before the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 39, 27 Sep. 1983
(GPO-27-043) Avail: Committee on Science and Technology

Following congratulations from the Committee, the crew of the eighth space shuttle flight discuss technical, logistical, and physiological aspects of the third Challenger space shuttle mission. Workloads, space adaptation syndrome, and payload related activities are discussed in connection with a film taken inside the orbiter. Photographs taken of Earth are included and special geological features are identified. A.R.H.

N84-14231# Air Force Geophysics Lab., Hanscom AFB, Mass. Aeronomy Div.
THE GASEOUS AND PLASMA ENVIRONMENT AROUND SPACE SHUTTLE
R. S. Narcisi, E. Trzcinski, G. Federico, L. Wlodyka, and D. Delorey (Boston Coll.) 13 Oct. 1983 9 p Presented at the AIAA Meeting, Washington, 1 Nov. 1983
(AF Proj. 2310)
(AD-A133900; AFGL-TR-83-0261) Avail: NTIS HC A02/MF A01 CSCL 22/2

A versatile ion/neutral quadrupole mass spectrometer was designed and developed in-house by the Composition Branch of the Air Force Geophysics Laboratory to measure the gaseous and plasma environment around the Space Shuttle. This report briefly describes the instrumentation, the various modes of operation, the data acquisition program and then presents some of the data obtained while operating in the neutral and ion modes. Measurements are presented of thruster firings, water dumps, energetic backscatter phenomena, the temporal behavior of contaminants, the plasma environment's modification by contaminants, ionospheric irregularities and vehicle potential measurements. GRA

N84-14204# Science Applications, Inc., McLean, Va.
THE SPACE SHUTTLE ENVIRONMENT AS EVIDENCE OF CRITICAL IONIZATION PHENOMENA
K. Papadopoulos (Maryland Univ., College Park) *In* ESA Active Expts. in Space Jul. 1983 p 227-244 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-14232# Harry Diamond Labs., Adelphi, Md.
A HIGH PERFORMANCE FIBER OPTIC TELEMETRY LINK FOR USE IN A SPACE RADIATION SIMULATOR
James C. Blackburn, Jonathan Vanderwall, and Raine M. Gilbert Jul. 1983 55 p
(Contract MIPR-82-676; X99QAXV)
(AD-A132738; HDL-TR-2011) Avail: NTIS HC A04/MF A01 CSCL 09/6

The transmitting end of the fiber optic link is designed to operate in a nuclear and space radiation simulator. It will function without noise increase or other degradation at up to approximately 10 to the 8th power rads (Si)/s of 1-MeV gamma rays and at cryogenic temperatures. The response is linear analog, with a bandwidth of 12 kHz to 350 MHz. Signal inputs are balanced with millivolt sensitivity. All functions are remote controlled through an RS-232 computer interface so that unattended operation is possible. Complete circuit diagrams, a discussion of the design, and test results are given. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-14233*# Grumman Aerospace Corp., Bethpage, N.Y.
ORBITER-BASED CONSTRUCTION EQUIPMENT STUDY. THE HPA/DTA TECHNOLOGY ADVANCEMENT PLAN
Oct. 1983 15 p refs
(Contract NAS9-16468)
(NASA-CR-174605; NAS 1.26:174605; DRL-T-1701; DRD-SE957T) Avail: NTIS HC A02/MF A01 CSCL 22B

Satellite berthing mechanism, umbilicals for fluid and electrical interfaces, EVA service platform, and large mass berthing mechanism are discussed. Author

N84-14234# Committee on Science and Technology (U. S. House).
NASA'S SPACE STATION ACTIVITIES
Washington GPO 1983 161 p Hearing before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 37, 2 Aug. 1983
(GPO-27-393) Avail: Subcommittee on Space Science and Applications

The status, plans, and activities associated with NASA's space station effort are reviewed. N.W.

N84-14235 California Univ., Los Angeles.
ACTIVE CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES Ph.D. Thesis
Michael Keith Mackay 1983 260 p
Avail: Univ. Microfilms Order No. DA8314665

The control of a large flexible space structure using a finite number of controls and observations is considered. The control problem is formulated as an optimal stochastic regulator. Various assumptions are made concerning the natural damping in the system. This leads to semigroup representations for the open loop system which are uniformly exponentially stable and compact, uniformly exponentially stable and noncompact, strongly stable, and unitary (no natural damping). New sufficient conditions are given for the existence of a solution to the control problem for the strongly stable and unitary cases. The solution to the control problem is obtained in terms of the compensator, i.e., the optimal linear operator mapping the observations to the control. Both time domain and frequency domain representations for the compensator are given and its modal approximation is studied. The general theory is applied to a space structure modeled as a rigid central body with two flexible appendages (cantilevered beams). Dissert. Abstr.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-14236# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
JANNAF HANDBOOK: ROCKET EXHAUST PLUME TECHNOLOGY. CHAPTER 6: SPACECRAFT PLUME CONTAMINATION
T. M. Gilliland, ed. Jun. 1983 328 p refs
(Contract N00024-83-C-5301)
(AD-A131689; CPIA-Publ-263) Avail: NTIS HC A15/MF A01 CSCL 21/8

Instructions and samples are given for solving problems on exhaust plume-induced spacecraft contamination, including both deposition and effects. Author

N84-14237# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SEPARATION BETWEEN STAGES OF MULTISTAGE CARRIER ROCKET
Xue Yu 10 Aug. 1983 14 p Transl. into ENGLISH from Hangkong Zhishi (China), no. 1, 1975 p 13-16
(AD-A132924; AD-F630031; FTD-ID(RS)T-1143-83) Avail: NTIS HC A02/MF A01 CSCL 16/4

Separation between stages in a multistage carrier rocket, an important problem to solve for a successful launch of a satellite, ballistic missile or spacecraft, is discussed. A brief introduction to the principles, mechanisms, and methods of separation is given. R.J.F.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-14238# Royal Aircraft Establishment, Farnborough (England).
RELATIONSHIPS BETWEEN THE GLASS TRANSITION, THERMODYNAMIC AND MECHANICAL VALUES AS POSSIBLE SOURCES OF INFORMATION CORRELATING MATERIAL PROPERTIES WITH CHEMICAL STRUCTURE
H. Batzer and Ursula T. Kreibich 30 Mar. 1983 19 p refs Transl. into ENGLISH from Die Angewandte Makromolekulare Chem. (West Germany), v. 105, no. 1661, 1982 p 113-130
(BR-90008; RAE-Trans-2108) Avail: NTIS HC A02/MF A01

The calculation of the glass transition temperature T(g) of linear and crosslinked polymers from the cohesive energy E (coh) normalized to the number of structural elements capable of some degree of motion was described. Linear relations were found between T(g) and the normalized molar heat C(p) as well as the normalized molecular weight MW (seg) of the repeating unit. So the cohesive energy, which is difficult to measure, may be determined from experimental value of the molar heat or even T(g). By applying these mentioned relations correlation of thermodynamic quantities with mechanical properties was found, e.g. the ratio of specific cohesive energy vs. density with the torsional modulus or the yield strength of crosslinked epoxide resins at 298K. Author

24 COMPOSITE MATERIALS

Includes laminates.

N84-14239 Stanford Univ., Calif.
BUCKLING, POSTBUCKLING, AND CRIPPLING OF MATERI-

ALLY NONLINEAR COMPOSITE PLATES Ph.D. Thesis
Rocky Richard Arnold 1983 180 p
Avail: Univ. Microfilms Order No. DA8314433

The objective of this study is to develop the required theory and analytical approach so that the buckling, postbuckling and crippling of laminated composite plates can be accurately predicted. Application of the theoretical analysis provides results which show good correlation with available experimentally determined load-shortening curves to failure for two typical graphite-epoxy materials. The inclusion of both transverse shear and material nonlinearity effects is shown to be essential for meaningful predictions of buckling, postbuckling stiffness, and ultimate load at failure (crippling). It is demonstrated herein that the use of the direct variational approach based on the Reissner principle significantly reduces the computational effort required for the solution of the nonlinear material aspect of the present problem. The theory and analysis procedure provides a basis for the rational design of lightly loaded primary structure components in future generation energy-efficient commercial aircraft and helicopters by virtue of exploiting the postbuckling strength inherent in laminated composite plates. Dissert. Abstr.

N84-14240 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
TORSIONAL VIBRATION MEASUREMENTS ON FIBER REINFORCED COMPOSITES [TORSIONSSCHWINGUNGSMESSUNGEN AN FASERVERBUNDWERKSTOFFEN]
J. Brandt and J. Warnecke 30 Nov. 1982 27 p refs In GERMAN
(MBB-BB-524-82-Oe) Copyright. Avail: Issuing Activity

Torsional vibration tests were performed on fiber reinforced composites in order to determine their physical-technological behavior. Temperature boundaries, hardening state, effects of humidity, and modifications due to vibrational load were determined for test samples. Author (ESA)

N84-14241 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
THE EFFECT OF HUMIDITY ON THE THERMOMECHANICAL BEHAVIOR OF CARBON FIBER REINFORCED EPOXY RESINS [EINFLUSS VON FEUCHTIGKEIT AUF DAS THERMOMECHANISCHE VERHALTEN VON KOHLEFASERVERSTAERKEN EPOXIDHARZEN]
J. Brandt and J. Warnecke 1982 25 p refs In GERMAN Presented at DGLR Symp. Entwicklung u. Anwendung von CFK-Strukt., Stuttgart, 26-27 May 1982
(MBB-BB-526-82-Oe) Avail: Issuing Activity

The relation between glass transition temperature and humidity decrease of carbon fiber reinforced laminates, and its consequences on the mechanical properties under humid warm conditions is reviewed. It is shown that the main reason for the negative effects of the humidity decrease on the mechanical properties at high temperatures, is the decrease in glass transition temperature of the epoxy matrix. The glass transition temperature in dry and humid state, experimentally determined by torsional vibration measurements, is in good agreement with predictions based on the free volume molecular model. The mechanical properties of fiber reinforced composites under humid warm conditions can be improved by an increase of the glass transition temperature of the epoxy matrix. Author (ESA)

N84-14242# Texas A&M Univ., College Station. Mechanics and Materials Research Center.
RESEARCH ON COMPOSITE MATERIALS FOR STRUCTURAL DESIGN Annual Technical Report, 1 Jan. - 31 Dec. 1982
D. Allen, W. Bradley, W. Haisler, J. Ham, B. Harbert, C. Hoeve, R. Schapery, and Y. Weitsman Apr. 1983 211 p
(Contract F49620-82-C-0057; AF Proj. 2307)
(AD-A134059; MM-4665-83-4; AFOSR-83-0861TR) Avail: NTIS HC A10/MF A01 CSCL 11/9

Summarized are research activities related to advanced fiber reinforced plastics in the areas of fracture, delamination, distributed damage, residual stresses, moisture effects, and toughening mechanisms in elastic and viscoelastic materials. Also included are nine papers and abstracts of three M.S. Theses describing recently completed work in these areas. GRA

N84-14243# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
CHARACTERISTICS OF VARIOUS TYPES OF ABLATIVE MATERIALS WITH ASSOCIATED NAVAL APPLICATIONS M.S. Thesis - MIT
James Marcellus Leary May 1983 81 p
(AD-A133882; CSDL-T-811) Avail: NTIS HC A05/MF A01 CSCL 11/7

This thesis discusses the thermal and mechanical properties of subliming, melting, charring, and intumescent ablative materials. The use of intumescent ablators as thermal protection in low heat flux environments is emphasized. Models for analysis of transient ablation are discussed. Naval applications of intumescent ablators are examined. Author (GRA)

N84-14244# Massachusetts Inst. of Tech., Cambridge.
STRUCTURE AND PHASE TRANSITIONS IN BROMINE AND POTASSIUM-MERCURY INTERCALATED GRAPHITE
A. Erbil, G. Timp, A. R. Kortan, R. J. Birgeneau, and M. S. Dresselhaus Apr. 1983 21 p
(Contract F49620-83-C-0011; AF Proj. 2306)
(AD-A133863; AFOSR-83-0761TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

High resolution X-ray scattering and electron microscopy results relevant to the inplane structure of two prototype graphite intercalation compound (GIC) systems, Br2-GIC and KHgx-GIC, are presented. Particular emphasis is given to intercalation kinetics and to structural coherence. Of special interest is the measurement using high resolution X-ray scattering of an intrinsic inplane intercalate domain size in Br2-GIC larger than 10,000. Evidence is presented for the formation of a two dimensional incommensurate domain wall structure for the Br2 intercalant along the 7 fold direction above T sub C = 69.08 C for stage 4 C28Br2. Evidence is also presented in the same compound for two dimensional anisotropic melting at T sub M = 100.25 C. Large dislocation free regions (100 a x 500 a) are observed directly in the lattice fringe images of a stage 1 KHg-GIC sample. GRA

N84-14245# Battelle Columbus Labs., Ohio.
MANUFACTURING METHODS AND TECHNOLOGY (MANTECH) PROGRAM. QUALITY CONTROL AND NONDESTRUCTIVE EVALUATION TECHNIQUES FOR COMPOSITES. PART 6: ACOUSTIC EMISSION: A STATE-OF-THE-ART REVIEW Final Report, 5 Aug. 1982 - 4 Feb. 1983
Marvin A. Hamstad St. Louis, Mo. Army Aviation Research and Development Command May 1983 238 p Prepared in cooperation with Denver Univ.
(Contracts DAAG29-81-D-0100; W-7405-eng-48)
(AD-A132621; USAAVRADCOM-TR-83-F-7; AMMRC-TR-83-25) Avail: NTIS HC A11/MF A01 CSCL 11/4

A comprehensive report on the subject of acoustic emission (AE) as applied to characterization and testing of composite materials and structures has been written. First, an extensive bibliography of over 300 references of the literature in this field is presented. This part includes author and subject indexes as well as a guide to the more significant literature. Second, the technical principles which must be adhered to in order to do a technically sound AE test on a composite sample are described is some detail. This part includes all aspects of standard testing and data analysis. Third, a representative survey of typical proven applications of AE to composites is presented. This survey has two basic divisions: (1) the application of AE to material studies of composites; and (2) the application of AE to quality control and/or nondestructive evaluation. Finally, a review of the progress in the research areas of AE and composites is given. This review covers the specific areas which have not yet been brought to maturity. In appropriate cases critical comments are made as well as suggestions for future work. GRA

N84-14246# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Materials and Metallurgical Engineering.
PULSED ELECTRODEPOSITION OF AMORPHOUS AND COMPOSITE ALLOYS Final Report, 1 Feb. 1980 - 1 Jun. 1983
Rolf Weil and Chin-Chang Nee 1 Sep. 1983 18 p
(Contract DAAG27-80-C-0056)
(AD-A132848; ARO-16782.1-MS) Avail: NTIS HC A02/MF A01
CSCL 11/6

Novel uses of pulsed current in the electrodeposition of alloys were investigated. The study resulted in the demonstration of the feasibility of depositing alternate layers of the same phase or different phases of controlled chemical compositions and thicknesses. The alternate-layer structure resulted in better strength properties in some cases. An orders-of-magnitude increase in the ductility in some layered alloys was discovered. Pulse plating also reduced uncontrolled compositional variations which cause the banded structure. GRA

N84-14247# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.
FIRST INVESTIGATIONS ON A WRAPPED FIBER BLANKET INSULATION WITH MASSIVE SPACERS CONSISTING OF CARBON FIBER COMPOSITE
P. Broeckerhoff and D. Stausebach (Interatom) Apr. 1983 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(JUEL-1840; ISSN-0366-0885) Avail: NTIS HC A04/MF A01

An insulation for the secondary hot gas duct system of a high temperature reactor is described. It consists of inner tubes made of graphite on which fiber blankets were wrapped. Massive spacers consisting of carbon fiber composite (CFC) bear the inner tubes. Temperature distribution within the insulation, at the spacers and along the pressure tube was investigated. Thermal fluxes and effective thermal conductivities were determined. Experiments were carried out in a high pressure wind tunnel with the media air and helium. Air temperature was restricted to 300 C because of corrosion. Max helium temperature was about 400 C. High pressure/velocity dependence is outlined. Natural and forced convection within the fibers and the high thermal conductivity of the spacers cause temperature peaks on the pressure tube of nearly 90 deg. C. Author (ESA)

N84-14248 Pennsylvania Univ., Philadelphia.
TOPICS IN GRAPHITE INTERCALATION CHEMISTRY WITH APPLICATIONS TO FIBER REINFORCED COMPOSITES Ph.D. Thesis
Theodore Sigmund Dziemianowicz 1983 261 p
Avail: Univ. Microfilms Order No. DA8316010

The chemical kinetics, structure, properties and stability of acceptor intercalated graphites, including fibers was studied and applied to fiber reinforced composites. A kinetic model which incorporates both nucleation of the interlaminar spaces and intercalant penetration was applied to the HNO3 intercalation of four different graphite types. The characteristic times for nucleation and penetration are ordered HOPG < natural powder < pitch fiber < PAN fiber. This hierarchy was related to the crystalline order and morphology of the various graphite types. Composites containing desorbed HNO3 intercalated fibers (0.5 + or - 3.0% residual nitrate) have identical interlaminar shear strengths to nonintercalated fiber composites at comparable fiber loading. At the 3% nitrate level, the resistance of intercalated composites is about a factor of 5 lower than in pristine fiber composites. Dissert. Abstr.

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-14249# Materials Research Labs., Melbourne (Australia).
X-RAY FLUORESCENCE ANALYSIS FOR BARIUM, ZINC, CALCIUM AND PHOSPHORUS IN OIL ADDITIVES
W. B. Searle (Materials Testing Lab., Sydney) Aug. 1983 19 p refs
(MRL-TN-475; AR-003-796) Avail: NTIS HC A02/MF A01

A thin film dilution technique is described for the determination of barium, zinc, calcium and phosphorus in oil additives using X-ray fluorescence spectrometry. The specimen was drawn into a thin film by means of a wire wound metering rod. An internal standard was used to compensate for variations in the overall film thickness. The accuracy and repeatability were determined by comparison with chemical results. The agreement obtained between X-ray and chemical results on a wide variety of samples showed that the thin film technique adequately compensated for inter-element effects. The limits of detection were 0.01% Ba, 0.02% Zn, 0.04% Ca and 0.01% P. Author

N84-14250# Materials Research Labs., Melbourne (Australia).
X-RAY FLUORESCENCE DETERMINATION OF SULPHUR IN OILS BY A THIN FILM METHOD
W. B. Searle (Materials Testing Lab., Sydney) Sep. 1983 17 p refs
(MRL-TN-474; AR-003-795) Avail: NTIS HC A02/MF A01

A thin film dilution sample preparation technique for the determination of sulfur in petroleum products is described. An internal control standard compensates for variations in oil film thickness. The procedure utilizes a mixture of sample and an alkyd resin to improve adhesion to a Mylar substrate and to reduce sample flow during irradiation. The method is quantitative and has good repeatability for sulfur contents up to 5%. Accuracy is comparable with that obtained by chemical methods. The detection limit for sulfur was estimated to be 0.03%. Author

N84-14251# Naval Research Lab., Washington, D. C. Polymeric Materials Branch.
EPR SPECTROSCOPY OF THERMALLY INITIATED FREE RADICALS IN RDX
M. D. Pace, D. R. Farrar, A. D. Britt, and W. B. Moniz 27 Oct. 1983 13 p
(RR01305)
(AD-A133976; NRL-MR-5212) Avail: NTIS HC A02/MF A01
CSCL 09/1

The explosive RDX exhibits EPR signals when heated to temperatures ranging from 120 C to 200 C. Neat RDX samples give intense EPR signals at 197 C. RDX dissolved into sulfolane gives intense EPR signals at 170 C and weaker signals detected as low as 120 C. A 0.1M solution of RDX in sulfolane gives an EPR spectrum at 170 C which is attributed to a nitroxide radical (H2C(NN02)2(CH2)2N-0). A 1M solution of RDX in sulfolane at 170 C and a neat sample of RDX at 197C give an identical spectrum of a second radical. GRA

N84-14252# Ohio State Univ., Columbus.
PROCEEDINGS OF THE 38TH SYMPOSIUM ON MOLECULAR SPECTROSCOPY
1983 178 p Proc. held in Columbus, Ohio, 13-17 Jun. 1983
Sponsored in part by Army
(AD-A133957) Avail: NTIS HC A09/MF A01 CSCL 07/4

Subject matter covered includes: (1) Electronic (large molecules); (2) Electronic (small molecules); (3) Electronic (theory); (4) Energy transfer; (5) High resolution IR & THEORY; (6) Laser spectra; (7) Liquid state; (8) Matrix spectra; (9) Microwave; (10) Molecular beam; (11) Raman spectra; (12) Solid state (electronic); (13) Solid state (infrared); (14) Techniques; and (15) Vibrational analysis. B.W.

N84-14253# Wisconsin Univ., Madison. Dept. of Chemistry.
POLARIZATION EFFECTS IN THE LUMINESCENCE OF CADMIUM SELENIDE ELECTRODES
Holger H. Streckert, Hal Van Ryswyk, Richard N. Biagioni, and Arthur B. Ellis 29 Sep. 1983 22 p Submitted for Publication
(Contract N00014-78-C-0633; NR Proj. 051-690)
(AD-A133951; UWIS/DC/TR-83/3) Avail: NTIS HC A02/MF A01 CSCL 07/4

Polarization properties of the emission from single-crystal, n-type CdSe samples have been examined. When excited with several ultrabond gap wavelengths, a-plates of n-CdSe (wurtziet structure) exhibit polarized photo-luminescence (PL) spectra consistent with the reported electronic structure of the solid. The spectra consist of two bands near the band gap energy (approximately 1.7 eV), assignable to transitions between the conduction band and a split valence band having its two highest-energy band edges separated by approximately 0.22 eV; the lower-energy band is preferentially polarized with E is perpendicular to c while the other band displays no polarization preference. Time-resolved PL data, obtained with 620-nm excitation from a N2-pulsed dye laser, were independent of polarization. Intensity-time curves yielded a decay time (t sub 1/e) of approximately 20 ns for both bands, providing evidence that the two emissive excited states are in thermal equilibrium. Emissive properties of n-CdSe, a-plate electrodes were also consistent with thermal equilibration. Polarized electroluminescence (EL) spectra, obtained using the solid as a dark cathode in aqueous peroxydisulfate electrolyte, closely resemble their PL counterparts, demonstrating attainment of similar excited-state populations in the two experiments. And when the semiconductor is used as the photoanode of a photoelectrochemical cell employing diselenide electrolyte, the two PL bands resulting from 514.5- or 632-nm excitation are quenched in parallel by the electric field present in the semiconductor. Author (GRA)

N84-14254# George Washington Univ., Washington, D.C. Dept. of Chemistry.
PHOTON-STIMULATED ION DESORPTION FROM CONDENSED CO AND N2
Hideo Sambe, Mohamed Yousif, and David E. Ramaker Sep. 1983 12 p Submitted for publication
(Contract N00014-80-K-0852; NR Proj. 056-681; PP0130801)
(AD-A133925; TR-12) Avail: NTIS HC A02/MF A01 CSCL 07/4

Previously measured photon-stimulated ion desorption yields from condensed CO and N2 surfaces are compared with the corresponding yields from gaseous CO and N2. Upon condensation, substantial change takes place in both the N+ and C+ yields. The origin of this change is attributed to an electronic polarization of the solid surfaces. GRA

N84-14255# George Washington Univ., Washington, D.C. Dept. of Chemistry.
UNDERSTANDING LOCALIZED BEHAVIOR IN THE AUGER SPECTRA OF COVALENT SYSTEMS SUCH AS GRAPHITE
David E. Ramaker, F. L. Hutson, R. R. Rye, J. E. Houston, and J. W. Rogers Sep. 1983 14 p Prepared in cooperation with Sandia National Labs., Albuquerque, N. Mex. Submitted for publication
(Contracts N00014-80-K-0852; DE-AC04-76DP-00789; NR Proj. 056-681; PP0130801)
(AD-A133924; TR-13) Avail: NTIS HC A02/MF A01 CSCL 07/4

Localized behavior in the CVV Auger lineshapes of atomic and metallic systems are easily understood within the Cini-Sawatsky theory, which assumes the final state holes are either localized in a single atomic orbital or not at all. In covalently bonded systems, intermediate levels of localization may occur such as onto bond or group orbitals. A set criteria to determine the level of localization has been published, however, a general procedure for determining the distortion effects due to intermediate localization has not been reported. This work describes and justifies the use of the Cini expression on various sub-bands of the self fold of the DOS. Application is made to the Auger lineshape of graphite, a reinvestigation of the experimental lineshape, and comparison with a more complete theoretical lineshape, indicates partial localization of the holes in the group orbitals and none in the pi orbitals. This interpretation is consistent with results for ethylene and benzene. GRA

N84-14256# George Washington Univ., Washington, D.C. Dept. of Chemistry.
COMPARISON OF AUTOIONIZATION AND PHOTOELECTRON SPECTRA OF CO
M. Yousif, D. E. Ramaker, and H. Sambe Sep. 1983 20 p Submitted for publication
(Contract N00014-80-K-0852; NR Proj. 056-681; PP-130801)
(AD-A133902; TR-11) Avail: NTIS HC A02/MF A01 CSCL 07/4

Photoelectron spectra and the autoionization portion of the Auger spectra are compared for CO. Eight final states of the photoelectron spectra coincide with those of the autoionization spectra: three of them are the well-known one-hole states and the other five are two-hole-one-electron states. A photoelectron band at 27.4eV is identified for the first time by its exact match to the strongest band of the autoionization spectra. The symmetries of these and other two-hole-one-electron states are induced by comparing the intensities of X-ray and UV photoelectron spectra. Author (GRA)

N84-14257# Chicago Univ., Ill.
STUDY OF ION-SOLID INTERACTIONS AND MATERIAL CHARACTERIZATION WITH A NEW HIGH-RESOLUTION SCANNING ION PROBE Final Report, 1 Jun. 1982 - 31 May 1983
Riccardo Levi-Setti 15 Jun. 1983 35 p
(Contract F49620-80-C-0074; AF Proj. 2305)
(AD-A133896; AFOSR-83-0765TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

The program is a collaboration between the University of Chicago and Hughes Research Labs. The major goal is to produce two 60 KeV high resolution (10-100 A), high current density (1 A/sq cm) ion microscopes/microprobes. The project is partly funded by the NSF. During the first year of the program, the basic optical and overall engineering design of the two microprobes was consolidated, with the procurement and contraction phase being completed near the end of the second year. GRA

N84-14258# California Inst. of Tech., Pasadena.
CHEMICAL REACTIONS IN TURBULENT MIXING FLOWS, REVISION Annual Report, 15 Apr. 1981 - 14 Apr. 1982
H. W. Liepmann, J. E. Broadwell, P. E. Dimotakis, and A. Roshko 2 Aug. 1983 48 p
(Contract F49620-79-C-0159; AF Proj. 2308)
(AD-A133874; AFOSR-83-0865TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

Work under this contract has proceeded along three main lines, an experimental program covering low heat release combustion of hydrogen and fluorine, and chemically reacting turbulent shear layers and jets in water, a theoretical model development program whose aim is to provide alternatives to gradient diffusion transport models, and a diagnostics development parallel program to advance the state of the art in experimental techniques, as dictated by our main experimental effort. Substantial progress has been made in all three areas. Notably, in the experimental program, we have completed a first set of measurements in our H2 + F2 combustion facility, as well as laser induced fluorescence measurements of chemically reacting jets and shear layers in water. These experiments prove conclusively that gradient transport models are inappropriate in describing these flows. In the theoretical area, we have shown good agreement between a simple mixing model, developed under this contract sponsorship, and our measurements. In the diagnostics area, important advances have been made in laser Doppler velocimeter, high speed thermometry, laser induced fluorescence and others. GRA

N84-14259# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

HIGH TEMPERATURE CATALYTICALLY ASSISTED COMBUSTION Final Report, 1 Aug. 1982 - 28 Jan. 1983

F. V. Bracco, B. S. H. Royce, and D. A. Santavicca 28 Jan. 1983 11 p

(Grant AF-AFOSR-0248-10; AF Proj. 2308)

(AD-A133864; AFOSR-83-0866TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

Results of research on a two dimensional, transient catalytic combustion model and on a high temperature perovskite catalyst are presented. A recently developed two dimensional, transient model has been used to study the ignition of CO/air mixtures in a platinum coated catalytic honeycomb. Comparisons between calculated and measured steady state substrate temperature profiles and exhaust gas compositions show good agreement. A platinum doped perovskite catalyst has been designed to exhibit low temperature light off and high temperature stability. Preliminary tests using a perovskite powder with 1% by weight platinum are encouraging, showing very little change in surface activity when used with propane fuel. Author (GRA)

N84-14260# Massachusetts Inst. of Tech., Cambridge.

MAGNETIC PROPERTIES OF CoCl2-INTERCALATED GRAPHITE

M. Elahy, M. Shayegan, K. Y. Szeto, and G. Dresselhaus Apr. 1983 16 p

(Contract F49620-83-C-0011; AF Proj. 2306)

(AD-A133860; AFOSR-83-0764TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

The temperature and magnetic field dependence of the magnetic susceptibility and heat capacity of graphite-CoCl2 are investigated to understand the role of dimensionality in the observed magnetic phase transitions. The structure of graphite-CoCl2 shows similarities between the magnetic layers of Co(+2) in pristine and in the intercalated CoCl2 compound. However, microstructural analysis shows the presence of small islands of magnetic ions. The theoretical model for the 2 dimensional planar magnets is extended to include small magnetic domains. The finite size effect analysis shows good agreement between the experimental and theoretical results. The presence of external magnetic fields demonstrates the static scaling hypothesis for the magnetic susceptibility and heat capacity. GRA

N84-14261# National Bureau of Standards, Washington, D.C. Quantum Chemistry Group.

APPLICATION OF QUANTUM CHEMISTRY TO ATMOSPHERIC CHEMISTRY Annual Report, 1 Oct. 1981 - 30 Sep. 1982

M. Krauss and W. J. Stevens 30 Sep. 1982 31 p

(Grant AFOSR-ISSA-82-0017; AF Proj. 2301)

(AD-A133836; AFOSR-83-0785TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Relativistic effective potentials have been used to calculate the electronic structure and spectroscopic properties of UO+. The excitation energies of the excited states of UO(+) were calculated using a restricted valence configuration interaction. Strong radiative transitions are predicted in the red part of the visible. These transitions are predominately atomic-like f to d. GRA

N84-14262# Air Force Academy, Colo. Molecular Dynamics Div.

A STUDY OF THE CH2NO2 RADICAL USING A MULTICONFIGURATIONAL SELF-CONSISTENT FIELD APPROACH Final Report, 15 Jun. - 1 Sep. 1983

Michael L. McKee 3 Sep. 1983 26 p

(AD-A133815; FJSRL-TR-83-0009) Avail: NTIS HC A03/MF A01 CSCL 07/3

The CH2NO2 radical is used as a model for first likely reactive species in the decomposition of high energy materials such as TNT (1,3,5-trinitrotoluene) or HMX (octahydro-1,3,5,7-tetraniro-1,3,5,6-Tetrazocine). Radical species can be observed in an ESR cavity during the inductive phase of decomposition; however, their identity is not clearly established. Semiempirical, single configurational, and eventually multiconfigurational ab initio calculations were carried out to determine the ground electronic state and the electronic distribution. Ab initio calculations based on a single configuration plus correlation could not distinguish the ground state. The MCSCF results indicate that the ground state is planar 2A state which results from the interaction of the planar 2B sub 1 and 2A sub 2 states the cross at a common C sub 2V geometry and which leads to a favorable asymmetric distortion from C sub 2V symmetry to a lower C sub S symmetry. A similar distortion was observed by Davidson and coworkers for NO2. The 2A state is 14.6 kcal/mol more stable than the 2B sub 1 state and 19.9 kcal/mol stable than the 2A state. The staggered 2B sub 2 state which is the C sub 2V ground state is 6.8 kcal/mol higher than 2A state. The planar 2A ground state has considerable spin density on the carbon and some on one oxygen in agreement with ESR results. Author

N84-14263# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.

MULTIANGULAR SCANNING ABSORPTION TECHNIQUES FOR THREE DIMENSIONAL COMBUSTION DIAGNOSTICS Final Report, 1 Sep. 1977 - 31 Aug. 1982

Robert Goulard Aug. 1982 11 p

(Grant AF-AFOSR-3439-77; AF Proj. 2308)

(AD-A133811; AFOSR-83-0862TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

This program explored the potential of absorption techniques for low ppm, real time three dimensional combustion diagnostics. Convolution, Fourier transforms and iterative algorithms have already been proven in X-ray absorption tomography and interferometric applications. They have been tested and compared for their ability to determine typical pollutant and radical concentrations as they appear in flames or exhausts. The effect of the number of scans has been analyzed for parallel beams. A satisfactory trade off was shown to exist between accuracy and the number of viewing angles. The potential of this method was demonstrated in the laboratory. GRA

N84-14264# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.

INJECTION, ATOMIZATION, IGNITION AND COMBUSTION OF LIQUID FUELS IN HIGH-SPEED AIR STREAMS Annual Scientific Report, 1 Dec. 1981 - 31 Dec. 1982

Joseph A. Schetz Jan. 1983 19 p

(Grant AF-AFOSR-0159-82; AF Proj. 2308)

(AD-A133806; VPI-AERO-131; AFOSR-83-0864TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

A simulation approach to studying hot flow subsonic cross-stream fuel injection problems in a less complex and costly cold flow facility was developed. A typical ramjet combustion chamber fuel injection problem was posed where ambient temperature fuel (Kerosene) is injected into a hot airstream. This case was transformed through two new similarity parameters involving injection and freestream properties to a simulated case where a chilled injectant is injected into an ambient temperature airstream. Experiments for the simulated case using chilled Freon-12 injected into the Va. Tech 23 x 23 cm. blow-down wind tunnel at a freestream Mach number of 0.44 were run. The freestream stagnation pressure and temperature were held at 2.5 atm. and 300 degrees K respectively. Results showed a clear picture of the mechanisms of jet decomposition in the presence of rapid vaporization. Immediately after injection a vapor cloud was formed in the jet plume, which dissipated downstream leaving droplets on the order of 8 to 10 microns in diameter for the conditions examined. This represents a substantial reduction compared to baseline tests run at the same conditions with water which had litte vaporization. The desirability of using slurry fuels for aerospace application has long been recognized, but the problems of slurry combustion have delayed their use. The present work is an experimental and numerical investigation into the break-up and droplet formation of laminar slurry jets issuing into quiescent air. GRA

N84-14265# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.
DIFFUSION MEASUREMENTS IN MICROEMULSIONS Final Report, Sep. 1982 - Dec. 1983
R. A. MacKay, N. S. Dixit (Drexel Univ.), R. Agarwal (Rutgers Univ., New Brunswick, N.J.), and Reginald P. Seiders Jun. 1983 17 p
(DA Proj. 1L1-61102-A-71-A)
(AD-A133801; ARCSL-TR-83035) Avail: NTIS HC A02/MF A01 CSCL 07/4

Diffusion coefficient measurements in both aqueous micelles and microemulsions have been carried out using the techniques of polarography and quasielastic light scattering (QLS). The former method involves the determination of the diffusion coefficient of an electroactive oil soluble probe at a polarizable microelectrode. For high water content microemulsions, both methods yield the same diffusion coefficients which can be identified as the self diffusion coefficient. For cetyltrimethylammonium bromide (CTAB) micelles, both methods yield the same result at the salt (NaBr) concentration at which the QLS measurements are independent of CTAB concentration. In more concentrated microemulsions, QLS data gave diffusion coefficients, in agreement with polarography only for a sodium cetyl sulfate (SCS) system at 65-75 wt % water. For the SCS microemulsions at 60% water, and CTAB microemulsion at 60-75% water, the QLS data yielded rapid, nonexponential decays. However, consistent polarographic diffusion coefficients could still be obtained. By using probes of varying chain length (oil solubility), it has been demonstrated that these CTAB and SCS microemulsions containing butanol and pentanol cosurfactants respectively, are not cosolubilized systems but do contain distinct hydrophilic and hydrophobic regions. Author (GRA)

N84-14266# Mississippi Univ., University. Physical Acoustics Research Group.
AMPLIFICATION OF SOUND BY GAS PHASE REACTIONS Interim Technical Report
Henry E. Bass and Richard M. Detsch 11 Oct. 1983 55 p
(Contract N00014-81-K-0691)
(AD-A133747; PARGUM-83-02) Avail: NTIS HC A04/MF A01 CSCL 07/4

A four year study of sound propagation in chemically reacting mixtures has led to experimental observation of sound amplification. Photo-initiated Cl2-H2-inert gas reactions provided the energy for the amplification observed. Amplification experiments were conducted in two modes which we termed pulsed and CW. For the pulsed experiments, high intensity UV-flash lamps dissociated molecular chlorine at the start of the experiments and the Cl2-H2-Ar reactions quickly went to completion; amplification was observed for about 6 msec. The measured gain was 1.8 at 2 kHz compared to gain of 4 predicted by theory. The source of this difference has not been resolved completely. In CW experiments, low intensity UV-fluorescent lamps dissociated molecular chlorine continuously during the experiments, this extended the time over which amplification was observed to about 800 msec. Experiments were conducted for three Cl2-H2-SF6 mixtures and four frequencies, 1.0, 2.5, 4.0, and 6.5 kHz. Attenuation measurements were conducted for several Cl2-SF6- and H2-SF6 mixtures. These data were used to calculate vibrational relaxation times for SF6 in collisions with Cl2, H2, and SF6 molecules. The vibrational relaxation times were used to predict vibrational relaxation attenuation in Cl2-H2-SF6 mixtures used in CW amplification experiments. GRA

N84-14267# College of the Holy Cross, Worcester, Mass. Dept. of Chemistry.
A MOLECULAR ORBITAL STUDY OF ATMOSPHERICALLY IMPORTANT SPECIES Final Report, 15 Jun. 1982 - 14 Jun. 1983
Carol A. Deakyne Jun. 1983 39 p
(Grant AF-AFOSR-0198-82; AF Proj. 2303)
(AD-A133656; AFOSR-83-0803TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

One objective of this work was to use ab initio molecular orbital (MO) theory to determine the optimum structure of CH(-)-HNO3 and to compute its adiabatic electron affinity, bond dissociation energy and charge distribution. Thus, a study of OH(-)-HNO3 and a series of simpler molecules and ions, which contain similar types of bonds and whose structures and adiabatic electron affinities are known, was carried out to find the most economical basis set which yields reliable results. The other molecules and ions considered were OH, OH(-), NH, NH(-), NB2, NH2(-), OOH, OOh(-), NO2, NO2(-), H2O, Oh(-)-H2O, HNO3, and HNO3(-). A second objective of this work was to probe the accuracy of the various basis sets in calculating energy changes for reactions involving negative ions. The results indicted that once the HNO3(-) was formed it broke down via electron detachment of dissociation into NO2- and OH around interaction energies of 0.8eV. The dissociation of HNO3(-) into OH(-) and NO2 was concluded to be a less likely loss process. GRA

N84-14268# Monsanto Research Corp., Dayton, Ohio.
HIGH TEMPERATURE (1645 DEG C, 3000 DEG F) SURFACE IGNITION TEST APPARATUS FOR FLUIDS Final Report, 1 Nov. 1980 - 31 Mar. 1982
Leo Parts and Richard G. Olt Wright-Patterson AFB, Ohio AFWAL Mar. 1983 41 p
(Contract F33615-78-C-2023; AF Proj. 3048)
(AD-A132658; MRC-DA-1116; AFWAL-TR-82-2110) Avail: NTIS HC A03/MF A01 CSCL 13/7

A high temperature surface ignition test apparatus has been designed, fabricated, and performance-tested. It was designed to determine ignition temperatures and to observe flame propagation characteristics of aircraft fluids at temperatures ranging up to 1649 C (3000 F). A resistance-heated graphite element functions as the hot surface. Its temperature is controlled by electrical power input. The graphite heater simulates graphite composite brake surfaces in high performance aircraft. Results of ignition tests with presently used and developmental fluids are presented. GRA

N84-14269# Howard Univ., Washington, D. C. Dept. of Chemistry.
LOW-FREQUENCY RAMAN SCATTERING FROM VITREOUS AND MOLTEN B2O3
G. E. Walrafen, M. S. Hokmabadi, P. N. Krishnan, S. Guha, and R. G. Munro (National Bureau of Standards) 8 Sep. 1983 47 p
(Contract N00014-80-C-0305)
(AD-A132698; TR-15) Avail: NTIS HC A03/MF A01 CSCL 11/2

Integrated Raman intensities of bands between 0-900 per cm were obtained for molten B203 from 288-906 C. Emphasis was placed on the highly depolarized low frequency contour (adjoining the exciting line) which is intense, broad, skewed to high frequencies, and displays a weak, broad, shoulder centered between 100-150 per cm. The total integrated contour intensity from 0-300 as well as the peak intensity, obey the one phonon Bose-Einstein (B.-E.) relation within 6%. The integrated intensity of the polarizd 800 per cm boroxol ring (B306) line, however, decreases with temperature rise, in quantitative agreement with previous work, J. Chem. Phys., 72, 113 (1980), and correction using neutron scattering results yields a enthalpy H-value of 5.0 kcal/mole ring rupture. The low frequency contour probably involves nonsymmetric collective modes of very large assemblies, cages, or rings, as well as librations of B306 groups (100-150 per cm), and the fact that the B.-E. distribution is obeyed at temperatures for which B306 ring rupture is important indicates that such large temporal aggregates are involved that whether B03 triangles or B306 rings are present may be nearly irrelevant. GRA

N84-14270# Howard Univ., Washington, D. C. Dept. of Chemistry.
LOW FREQUENCY RAMAN SPECTRA OF V-B2O3 AS A FUNCTION OF TEMPERATURE AND PRESSURE
Soumyendu Guha and George E. Walrafen 8 Sep. 1983 50 p
(Contract N00014-80-C-0305)
(AD-A132699; TR-16) Avail: NTIS HC A03/MF A01 CSCL 07/4

Raman studies of vitreous B2O3 have been conducted between 8 and 700K, and as a function of hydrostatic pressure (about 8 kbar) at room temperature. The low temperature Raman spectra exhibit two broad bands at 50/cm and 137/cm. From the temperature dependence of the 50/cm band, it has been concluded that the vibrational density of states in the low frequency region (30 < w < 300/cm) is better described when the Raman coupling coefficient C sub b varies as w. A shift in frequency of the Raman spectra as a function of temperature is attributed to a structural change near the glass transition. Near the glass transition temperature. the boroxol rings break up thereby leading to a more open structure. Above the melting point, i.e. when the viscosity is low, a regrouping of atoms occurs which results in a low density random network structure of B03 triangles. GRA

N84-14271# SRI International Corp., Menlo Park, Calif.
STUDY OF NITRATION AND OXIDATION IN OXYNITROGEN SYSTEMS Final Report, 5 Dec. 1979 - 4 May 1983
David S. Ross, Robert J. Schmitt, and Ripudaman Malhotra Jun. 1983 81 p
(Contract DAAG29-80-C-0046)
(AD-A132742; ARO-16742.9-CH) Avail: NTIS HC A05/MF A01 CSCL 07/4

Our nitration results consistently demonstrate difficulties with the conventional nitronium ion scheme for mixed acid nitration. Ion molecule studies showed that the Wheland intermediate to aromatic nitration is not formed from the reaction NO(+2)+ArH, but rather from NO2+ArH+, a result consistent with electron transfer in aromatic nitration. In accord with this observation, we have found that the naphthalene radical cation, prepared independently and isolated as the crystalline salt and dissolved in nitromethane, reacts with NO2 in that medium to give nitronaphthalene with an alpha/beta ratio of about 50. In sulfuric acid media, we have measured directly the rates of nitronium ion formation and its rection with water over a range of acidities using 14N nmr spectroscopy. We also studied reactive aromatic hydrocarbons including mesitylene and p-xylene in fresh, NOx-free acid solution, but in the absence of NOx scavengers such as urea. In electrochemical studies in nitric acid, we have demonstrated the first electrochemical synthesis of TNT. The process takes place at room temperature in NO2/HNO3 media. GRA

N84-14272# Naval Postgraduate School, Monterey, Calif.
EXCITATION FREQUENCY DEPENDENCE OF CONDUCTIVITY OF ELECTROLYTIC SOLUTIONS M.S. Thesis
John Benedict Kolbeck Jun. 1983 89 p
(AD-A132782) Avail: NTIS HC A05/MF A01 CSCL 07/2

The frequency dependence of the electrolytic conductivity was studied for solutions of varying concentrations of NaCl, MgSO4, KCl, and KBr. An experimental test fixture was designed and an equivalent electrical model of the test system developed. A theoretical model of the conductivity that accounts for charge carrier inertia is proposed. Measured values of the impedance at various frequencies were used to generate test system model parameters, and subsequently identify sample response. Interpretation of the sample response using the conductivity model allowed determination of the conductivity, which is presented in the form of the D.C. value or real part, Ko and the non-dielectric time constant, Tc. The conductivity of the solutions decreased with increasing frequency and the initial measurements of Tc were of the order of nanoseconds. Variations in Ko with salinity were in agreement with the empirical formula of Walden. GRA

N84-14273# Wisconsin Univ., Madison.
DROPLET DECOMPOSITION IN A REACTIVE ATMOSPHERE: COMPLETE RESPONSES FOR LARGE ACTIVATION ENERGIES
H. V. McConnaughey (Mississippi State Univ.) and G. S. S. Ludford (Cornell Univ.) Jun. 1983 41 p Sponsored in part by the Alexander von Humboldt Foundation
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A132840; MRC-TSR-2535) Avail: NTIS HC A03/MF A01 CSCL 12/1

A two-step combustion process, consisting of monopropellant (i.e., one-reactant) burning followed by bipropellant (i.e., two-reactant) burning, is considered. The original reactant, namely vapor from a liquid droplet, decomposes into a fuel that combines with oxidant in the surrounding atmosphere. Complete responses M(D1, D2) of the evaporation rate M of the droplet to the Damkohler numbers D1, D2 if the two reactions are determined in the limit of large activation energies. Conditions under which the response is monotonic or multi-valued (thereby exhibiting auto-ignition and auto-extinction) are identified. Previous conjectures, based on Damkohler-number asymptotics, are found to be mostly correct. Author (GRA)

N84-14274# Clemson Univ., S.C. Dept. of Chemistry.
SYNTHETIC AND MECHANISTIC STUDIES IN FLUORINE CHEMISTRY. NEW DEVELOPMENTS IN ORGANONITROGEN FLUORINE CHEMISTRY Final Technical Report, 20 Sep. 1982 - 31 May 1983
Darryl D. DesMarteau 17 Aug. 1983 9 p
(Contract DAAG29-82-K-0188)
(AD-A132844; TR-1; ARO-20004.5-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Synthesis and properties of novel organonitrogen fluorine compounds were investigated with emphasis on the synthesis of new perhalogented oxaziridines, reactions of CF2=NF and SF4=NF, and fluoride promoted reactions of imines and nitriles. GRA

N84-14275# Wisconsin Univ., Madison. Mathematics Research Center.
NOTE ON EVAPORATION IN CAPILLARIES
R. E. Meyer Jul. 1983 35 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-15064)
(AD-A132850; MRC-TSR-2537) Avail: NTIS HC A03/MF A01 CSCL 11/7

Factors are discussed which govern evaporation of liquid in small capillaries of greatly varying bore, such as might be encountered in porous media. If the escape of the vapor is relatively unobstructed, marked temperature gradients are found to be confined to close neighborhoods of the menisci. Evaporation is shown to proceed in statically unstable configurations under a dynamic balance of surface tension, local evaporation rate and viscous shear. The larger capillary throats clear first, the smallest ones remain full of liquid. Evaporation rates and fluid velocities are determined approximately. GRA

N84-14276# Colorado State Univ., Fort Collins. Dept. of Chemistry.
MOLECULAR SUPERSONIC JET STUDIES OF ANILINE SOLVATION BY HELIUM AND METHANE
E. R. Bernstein, K. Law, and Mark Schauer 16 Sep. 1983 53 p Submitted for publication
(Contract N00014-79-C-0647)
(AD-A132879; TR-12) Avail: NTIS HC A04/MF A01 CSCL 07/3

Several aspects of the An-CH4 system have also been explored. These studies emphasize that 2-color MS experiments are essential to the study of vdW clusters and that they complement the FE and DE techniques. The 2-color MS experiment can be used to identify the origins and vdW vibrations associated with (An(CH4) and An(CH4)2 vibronic transitions. With this information it is possible to assign several cluster DE spectra. It is found that the vdW stretching frequency is nearly identical in the ground and excited states and that vibronic transitions evidence a strong delta V = 0 (in which V is some quantum of the vdW stretch) propensity rule. Also, it is demonstrated that attaching a CH4 molecule to An increases the density of states in the system to the point at which the rate of intramolecular vibrational redistribution (IVR) becomes comparable to the rate of fluorescence. Therefore, the kinetics of energy flow in the excited state may be addressed. The results and discussion sections of this paper are each divided into two parts. First, new information concerning the An-He system will be presented and discussed in terms of their significance for

I. Second, the results of FE, DE, and 2-color MS studies of the An-CH4 system will be shown and similarities and differences between the An-He and An-CH4 systems will be addressed. GRA

N84-14277# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
MATRIX-ISOLATION PHOTOACOUSTIC SPECTROSCOPY
R. W. Shaw, H. E. Howell, G. Mamantov, and E. L. Wehry 1983 7 p refs Presented at the 26th ORNL-DOE Conf. on Analytical Chem. in Energy Technol., Knoxville, Tenn., 11 Oct. 1983
(Contract W-7405-eng-26; Grant NSF CHE-80-25282)
(DE84-001967; CONF-831025-19) Avail: NTIS HC A02/MF A01

The first photoacoustic (PA) spectra of polycyclic aromatic hydrocarbons and n-heterocycles isolated in rare gas matrices at 5 to 10K was recorded. Matrix-isolation sampling was utilized in the hope of improving PA spectral resolution so as to provide greater analytical selectivity for the analysis of mixtures. The most sensitive transducer found was an undamped PZT disc, yielding detection limits ranging from 50 to 500 ng, depending on the molar absorptivity of the individual compound measured. Matrix isolation spectra of n-heterocycles in argon were two- to three-fold sharper than their room temperature solution counterparts. Internal and external heavy atom effects were observed for naphthalene. DOE

N84-14278# Dynamics Technology, Inc., Torrance, Calif.
PDF: A COMPUTER PROGRAM FOR CALCULATION OF TURBULENT COMBUSTION UTILIZING A PROBABILITY DENSITY FUNCTION (PDF) APPROACH
John J. Wormeck Sep. 1983 119 p refs
(Contract DE-AC03-81ER-10964)
(DE84-002525; DOE/ER-10964/T4) Avail: NTIS HC A06/MF A01

A detailed description and user's guide for a collection of FORTRAN-77 subroutine subprograms which enable the extension of any existing hydrodynamic computer code to the calculation of multi-dimensional, laminar or turbulent flows with chemically complex equilibrium stationary states is described. The version of PDF described is limited to adiabatic, homogeneous, ideal gas-phase chemical equilibrium. An example calculation is given for a parabolic flow for mixing and combustion of initially unmixed methane and air in a simple shear flow. DOE

N84-14279# Sandia Labs., Albuquerque, N. Mex.
CHEMISTRY OF SHOCK COMPRESSION: A BIBLIOGRAPHY
R. A. Graham, B. Morosin, and B. Dodson Oct. 1983 86 p Presented at the Workshop on Shock Chem., Seattle, 28-29 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE84-002192; SAND-83-1887) Avail: NTIS HC A05/MF A01

A bibliography and limited evaluation of the literature concerning chemical effects under shock compression are presented. A brief summary of the contents of review articles and listing of conference proceedings is followed by collections of literature on organic substances, inorganic substances, shock-activated sintering, electrochemistry, recovery fixtures and general topics. A complete author index with over 500 entries and a limited subject index are presented. Over 400 references are included in the bibliography. DOE

N84-14280# Sandia Labs., Livermore, Calif. CRF Technology Div.
FUNDAMENTAL COMBUSTION AND DIAGNOSTICS RESEARCH AT SANDIA Progress Report, Jan. - Mar. 1983
M. A. Gusinow, ed. Oct. 1983 52 p refs
(Contract DE-AC04-76DP-00789)
(DE84-001787; SAND-83-8244) Avail: NTIS HC A04/MF A01

A combustion Research Facility was established. The development and application of advanced research methods, taking advantage of the latest progress in laser and computer technologies is emphasized. The following projects are reported: progress on flame research; research in combustion chemistry and modeling; results in diagnostics research; and technical highlights on resources developed and made available at the combustion research facility. DOE

N84-14281# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
EFFECT OF HYDRODYNAMIC FLOW ON THE MORPHOLOGY OF ELECTRODEPOSITED ZINC Ph.D. Thesis
J. L. Faltemier and C. W. Tobias Aug. 1983 169 p refs
(Contract DE-AC03-76SF-00098)
(DE84-001816; LBL-16485) Avail: NTIS HC A08/MF A01

The influence of hydrodynamic flow and other process variables on the macromorphology of electrodeposited zinc were investigated. Zinc deposited from acidic halide and sulfate solutions at rates far below the mass transfer controlled region show remarkable impressions of the hydrodynamic flow. It is shown that a sharp dependence of nucleation rate, as against rate of crystal growth, on overpotential (or current density) is the principal cause for the development of striations. The nucleation rate of crystals progressively increases as the current density level is raised, dominating any preferential, outward growth of crystallites and producing a smooth surface. At the lower current density levels, wakes forming behind the largest crystallites cause improved mass transport because of small decreases in the mass transfer overpotential; as a consequence, current density increases locally in the wakes. Better mass transport and smaller ohmic resistance to the developing ridges support their continued preferential growth, resulting in fully striated deposits. DOE

N84-14282# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MASS TRANSFER AT GAS-EVOLVING SURFACES IN ELECTROLYSIS Ph.D. Thesis
D. W. Dees and C. W. Tobias Sep. 1983 307 p refs
(Contract DE-AC03-76SF-00098)
(DE84-002567; LBL-16176) Avail: NTIS HC A14/MF A01

A novel micromosaic electrode was developed to resolve time dependent, mass transfer distribution in the close vicinity of bubble phenomena. A computer actuated data acquisition and control system was assembled and the software developed to monitor the current to each of the segments and control the potential of selected segments. The utility of the electrode to examine interfacial mass transport phenomena which have characteristic lengths as small as 100 microns was demonstrated. The effect of a single hydrogen bubble disengagement and of the coalescence of two bubbles, on the limiting current of the reduction of ferric to ferrous ion was measured using the micromosaic electrode in a horizontal: facing up orientation. In the absence of gas evolution, large regular fluctuations in the limiting current to the segments with a period of 29 sec were observed. This perodic behavior is attributed to free convection: a cellular fluid motion moving across the electrode with a velocity of 40 microns/second. It was found that the mass transfer enhancement due to bubble disengagement is small when compared to that due to coalescence. Increases in the mass transfer rate of more than an order of magnitude over the free convection limiting current were observed for the coalescence phenomena. DOE

N84-14283# Pittsburgh Univ., Pa. Dept. of Chemistry.
SURFACE STUDIES OF WO3/Al2O3 AND Ni/W/Al2O3 CATALYSTS
1983 28 p refs
(Contract DE-AC22-80PC-30204)
(DE84-000930; DOE/PC-30204/T1) Avail: NTIS HC A03/MF A01

X-ray photoelectron spectroscopy, laser Raman spectroscopy and ion scattering spectroscopy were used to investigate the surface structure of supported tungsten catalysts for hydrodesulfurization of sulfur containing petroleum fractions. The properties of WO3/Al2O3 catalysts were examined as a function of metal loading, calcination temperature and reduction time. The addition of nickel was also studied to determine its effect on the tungsten species present on the catalyst surface. This study has provided a comprehensive picture of the nature of the tungsten species present in WO3/Al2O3 and Ni/W/Al2O3 catalysts. It was shown that WO3/Al2O3 and MoO3/Al2O3 catalysts are very similar structurally. Preliminary results for Ni/W/Al2O3 catalysts showed that the promoting action of Ni is different than that of Co in Co/Mo/Al2O3 catalysts. DOE

N84-14284# Argonne National Lab., Ill. Materials Science and Technology Div.
ELASTIC MODULI OF H2O: LIQUID, ICE 6 AND ICE 7
M. Grimsditch, A. Rahman (Paris-6 Univ.), and A. Polian 1983 8 p refs Presented at the 9th AIRAPT Conf., Albany, N.Y., 24-29 Jul. 1983
(Contract W-31-109-eng-38)
(DE83-017960; CONF-830763-14) Avail: NTIS HC A02/MF A01

The results of a Brillouin scattering study of the room temperature phases of H2O (liquid, ice 6 and ice 7) up to 30 GPa are presented. Longitudinal elastic moduli thus obtained are compared with values of the bulk modulus obtained from density measurements and with both static and molecular dynamics calculations of the bulk modulus using potentials which were proposed in studies of the liquid state. The calculations indicate that the potentials are not capable of describing the high pressure region of ice 7. DOE

N84-14285# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ELEMENTARY REACTIONS OF NH2 RADICALS IN THE GAS, PHASE 3
W. Hack, H. Kurzke, and H. Gg. Wagner Jan. 1983 29 p refs
(MPIS-2/1983; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,35

The reaction: NH2 (X2B1) + O2 (3 Sigma g-) yields products (1) was examined in isothermal discharge flow system at room temperature and a total pressure of P = 4 mbar with He as the main carrier gas. The NH-2-decay was followed by laser induced fluorescence (LIF) in a large excess of O2. The rates were evaluated by assuming pseudo first order conditions. The production of NH2 in the reaction F + NH3 yields NH2 + HF, which was used as a NH2-source, was observed quantitatively by LIF of NH2-radicals. No H-atoms were observed by atom resonance absorption. Addition of O2 to the F2 flow has a significant influence on the NH2 profile as well as on the products formed. The rate constant for reaction (1) is K1 (295 K) = (4.8 + or - 1) 100 million cu cm/mol sec. This result agrees with an earlier investigation. It is discussed with respect to measurements in photolytic systems. Author (ESA)

N84-14286 Princeton Univ., N. J.
STUDIES OF FLAME SPREAD IN AN OPPOSED FLOW OVER SURFACES OF SOLID FUELS Ph.D. Thesis
Indrek Sven Wichman 1983 224 p
Avail: Univ. Microfilms Order No. DA8318705

The problem of steady counterflow laboratory-scale laminar flame spreading over thermally thick solid fuels is studied. A formula for the rate of flame spread is developed that includes the effects of the gas-phase velocity gradient at the surface (from the no-slip condition), the finite rate chemical kinetic processes in the flame and the effects of streamwise and transverse diffusion of heat and species in the solid and in the gas. The physical assumptions employed throughout are: constant thermophysical and transport properties in the solid and in the gas, a constant surface vaporization temperature, a nonregressing vaporizing fuel bed and a one-step phase reaction. Dissert. Abstr.

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-14287*# Columbia Univ., New York. Center for Strategic Materials.
EFFECTS OF COBALT IN NICKEL-BASE SUPERALLOYS Final Report
John K. Tien and Robert N. Jarrett Dec. 1983 26 p refs Presented at High Temp. Alloys for Gas Turbines Conf., Liege, 4-6 Oct. 1982
(Contract NAG3-57)
(NASA-CR-168308; NAS 1.26:168308) Avail: NTIS HC A03/MF A01 CSCL 11F

The role of cobalt in a representative wrought nickel-base superalloy was determined. The results show cobalt affecting the solubility of elements in the gamma matrix, resulting in enhanced gamma' volume fraction, in the stabilization of MC-type carbides, and in the stabilization of sigma phase. In the particular alloy studied, these microstructural and microchemistry changes are insufficient in extent to impact on tensile strength, yield strength, and in the ductilities. Depending on the heat treatment, creep and stress rupture resistance can be cobalt sensitive. In the coarse grain, fully solutioned and aged condition, all of the alloy's 17% cobalt can be replaced by nickel without deleteriously affecting this resistance. In the fine grain, partially solutioned and aged condition, this resistance is deleteriously affected only when one-half or more of the initial cobalt content is removed. The structure and property results are discussed with respect to existing theories and with respect to other recent and earlier findings on the impact of cobalt, if any, on the performance of nickel-base superalloys. Author

N84-14288*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TOPOLOGICAL REACTION RATE MEASUREMENTS RELATED TO SCOFFING
James L. Lauer (Rensselaer Polytechnic Inst.), Simon S. Fung (Rensselaer Polytechnic Inst.), and William R. Jones, Jr. 1983 19 p refs Presented at the Joint Lubrication Conf., Hartford, Conn., 18-20 Oct. 1983
(NASA-TM-83486; NAS 1.15:83486; E-1810) Avail: NTIS HC A02/MF A01 CSCL 11F

A ball-on-plate (both consisting of hardened M-50 steel) sliding elastohydrodynamic contact was run with trimethylolpropane triheptanoate (TMPTH) with and without tricresyl phosphate (TCP). The contact area of the plate was optically profiled with a phase-locked interference microscope (PLIM) both before and after exposure to alcoholic hydrochloric acid. As scuffing was approached, the profile within the contact region changed more rapidly after the acid treatment; after scuffing, it assumed a constant high value. A metallurgical phase found in the scuff mark was apparently responsible for the high reactivity. The microscopic profile changes (sensitivity, + or - 3 nm (+ or - A) in depth) involved primarily the small asperities (radius, < 3 microns); the larger ones were unaffected. Soaking the steel in TCP smoothed the fine structure of the surface profile but increased its reactivity toward alcoholic hydrochloric acid before sliding was started. Thus it would appear that PLIM examination could be used for screening potentially scuff-resistant materials. Author

N84-14289*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARTICULATE EROSION MECHANISMS
P. VeerabhadraRao (Cleveland State Univ.) and Donald H. Buckley 1983 12 p refs To be presented at the Cavitation and Multiphase Flow Forum, New Orleans, 11-17 Feb. 1984
(NASA-TM-83551; NAS 1.15:83551; E-1914) Avail: NTIS HC A02/MF A01 CSCL 11F

Particulate damage and erosion of ductile metals are today plaguing design and field engineers in diverse fields of engineering and technology. It was found that too many models and theories were proposed leading to much speculation from debris analysis and failure mechanism postulations. Most theories of solid particle erosion are based on material removal models which do not fully represent the actual physical processes of material removal. The various mechanisms proposed thus far are: melting, low-cycle fatigue, extrusion, delamination, shear localization, adhesive material transfer, etc. The experimental data on different materials highlighting the observed failure modes of the deformation and cutting wear processes using optical and scanning electron microscopy are presented. The most important mechanisms proved from the experimental observations of the specimens exposed to both spherical and angular particles are addressed, and the validity of the earlier theories discussed. Both the initial stages of damage and advanced stages of erosion were studied to gain a fundamental understanding of the process. Author

N84-14290*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLIDIFICATION RATE INFLUENCE ON ORIENTATION AND MECHANICAL PROPERTIES OF MAR-M-246+Hf
David Hamilton Nov. 1983 14 p refs
(NASA-TM-82558; NAS 1.15:82558) Avail: NTIS HC A02/MF A01 CSCL 11F

The influence of solidification rates on the orientation and mechanical properties of MAR-M-246+Hf was studied. The preferred orientation was found to be (001) for single crystals, with all samples with 45 degrees of (001). Tensile tests were performed at room temperature. The anisotropy of directionally solidified MAR-M-246+Hf was demonstrated by gage section deformation. Dendrite arm spacing and crystal growth were found to depend on solidification rates and source material conditions. The greatest strength occurred at lower solidification rates. Some single crystals were grown by control of growth rates without seeding. Author

N84-14291# National Bureau of Standards, Washington, D.C. Metallurgy Div.
APPLICATION OF SOLIDIFICATION THEORY TO RAPID SOLIDIFICATION PROCESSING Semiannual Technical Report, 1 Oct. 1982 - 31 Mar. 1983
W. J. Boettinger, J. W. Cahn, S. R. Coriell, J. R. Manning, and R. J. Schaefer Aug. 1983 47 p
(ARPA Order 3751)
(AD-A134132) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objective of this work is to develop guidelines based on kinetic and thermodynamics solidification theory for prediction and control of rapid solidification processes. In particular, segregation effects and rules governing the formation of equilibrium and non equilibrium phases, will be investigated. Areas where significant improvements in alloy properties can be produced by rapid solidification will be emphasized. GRA

N84-14292# Naval Weapons Center, China Lake, Calif. Engineering Dept.
MAGNETIC PROPERTIES OF IRON AND LOW-CARBON STEEL FOR SOFT MAGNET APPLICATION Final Report, 1980 - 1981
James L. Stokes Aug. 1983 15 p
(AD-A134120; AD-E900272; NWC-TP-6455) Avail: NTIS HC A02/MF A01 CSCL 11/6

An investigation was conducted to assess the relative merits of five soft magnet materials proposed as alternatives to ARMCO Electromagnet Iron (EMI), which is no longer available. Four irons and an SAE J403 (1005) (Unified Numbering System UNS G10050) steel were considered. When annealed in 94% nitrogen-6% hydrogen at 843 degrees C (1550 degrees F) for 4 hours and aged at 100 degrees C (212 degrees F) for 400 hours, two of the irons were found to be equivalent to EMI with regard to both coercive force and magnetic stability. A third iron exhibited similar magnetic properties after annealing, but required a higher annealing temperature to reduce the coercive force to an acceptable value. The fourth iron and the 1005 steel met the coercive force requirement after annealing at 843 degrees C (1550 degrees F) in 94% nitrogen-6% hydrogen, but suffered significant increases in coercive force during aging at 100 degrees C (212 degrees F). GRA

N84-14293# Naval Academy, Annapolis, Md. Div. of Engineering and Weapons.
BENDING FATIGUE OF A PARTICULATE SIC/Al 6061 METAL MATRIX COMPOSITE Final Report, Oct. 1982 - Sep. 1983
J. R. Boorujy, D. F. Hasson, and C. R. Crowe Sep. 1983 20 p
(SF61544603)
(AD-A134108; USNA-EW-20-83) Avail: NTIS HC A02/MF A01 CSCL 11/6

The bending fatigue behavior of 20 volume percent SiC particulate reinforced Al 6061-T6 sheet was investigated. Improved mechanical properties and ductility in the material, as compared to past results and Al 6061-T6 sheet, provided higher fatigue resistance. Low cycle fatigue specimens failed immediately after crack initiation. High cycle fatigue specimens exhibited a coarse step morphology, but classic striations were not observed. The existence of crack propagation at lower stresses was not verified. Preliminary results suggest that the fatigue resistance of particulate SiC reinforced/Al6061 composite exhibits orientation dependence. Also, particulate SiC reinforced/Al6061 composite has less fatigue resistance than whisker reinforced material. Improvement in surface finish also needs to be made over presently available material. GRA

N84-14294# Purdue Univ., Lafayette, Ind.
GRAIN STRUCTURE IDENTIFICATION BY ULTRASOUND FREQUENCY AVERAGING AND DECONVOLUTION Final Report, 1 Jun. 1981 - 31 Aug. 1982
E. S. Furgason Jul. 1983 40 p
(Grant AF-AFOSR-0177-81; AF Proj. 2306)
(AD-A134054; AFOSR-83-0744TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objective of this research program was to develop a technique to nondestructively measure average grain size as a function of position and to also provide some measure of the size distribution of the scatterers. To nondestructively evaluate the microstructure, the material was probed using broad-band ultrasound. The resulting backscattered ultrasound echoes were then processed to obtain the required microstructure parameters by applying techniques adapted from our previous work on Flaw Enhancement in large grain materials. Previous work on nondestructive microstructure evaluation has centered on obtaining a single parameter related to the average grain size in a relatively large volume of material. In contrast, this research effort was directed toward evaluating the local microstructure of the material as a function of position. This does not imply a point-by-point mapping of grain size, but rather the evaluation of grain statistics within small volumes of the bulk material. GRA

N84-14295# Rhode Island Univ., Kingston.
GORDON CONFERENCE ON PHYSICAL METALLURGY (1983) Final Report, 1 May - 30 Sep. 1983
Neil E. Paton 24 Jun. 1983 16 p Conf. held in Plymouth, N. H., 20-24 Jun. 1983
(Grant AF-AFOSR-0119-83; AF Proj. 2306)
(AD-A134034; AFOSR-83-0842TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

The topic chosen for the 1983 Gordon Conference on Physical Metallurgy was High Temperature Deformation with the emphasis of the presentations being on large strain deformation and microstructure effects. Over one hundred scientists attended the conference, with 21 of them being from outside the United States, mostly from Europe. The quality of the presentations was uniformly excellent, prompting stimulating discussion periods with an extensive exchange of ideas for new approaches and research opportunities. GRA

N84-14296# Georgia Inst. of Tech., Atlanta. Fracture and Fatigue Research Lab.
THE EFFECT OF MICROSTRUCTURE ON THE PROPERTIES OF HIGH STRENGTH ALUMINUM ALLOYS Final Report, 1 Jan. 1978 - 1 Jan. 1983
Edgar A. Starke, Jr. Jan. 1983 10 p
(Grant AF-AFOSR-3471-78; AF Proj. 2306)
(AD-A133997; AFOSR-83-0845TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

This program was initiated in January, 1978, and was concerned with the effect of microstructure on the properties of two different classes of aluminum alloys of current interest to the Air Force:

(1) high strength Al-Zn-Mg-X alloys and (2) low density, high modulus Al-Li-X alloys. The program terminated on December 31, 1982. GRA

N84-14297# Rockwell International Science Center, Thousand Oaks, Calif.
DEFORMATION AND FATIGUE OF AIRCRAFT STRUCTURAL ALLOYS Final Report, 1 Jan. 1980 - 31 Dec. 1982
J. A. Wert, J. C. Chesnutt, and M. R. Mitchell Jul. 1983 106 p
(Contract F49620-80-C-0030; AF Proj. 2306)
(AD-A133947; SC5254.2FR; AFOSR-83-0745TR; FR-1) Avail: NTIS HC A06/MF A01 CSCL 11/6

This final report describes results obtained during the course of a two-part basic research program addressing problems of airframe structural materials. Both areas of investigation concentrated on deformation of alpha-Beta titanium alloys. 1n Part I, superplasticity of two-phase titanium alloys was investigated, with the goal of improving the superplastic forming capabilities through alloy modifications. Part 2 of this program concentrated on understanding the early stages of fatigue crack initiation and propagation in titanium alloys. GRA

N84-14298# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
HYDROGEN EMBRITTLEMENT OF TITANIUM SHEET UNDER MULTIAXIAL DEFORMATION PATHS
R. J. Bourcier and D. A. Koss Aug. 1983 32 p
(Contract N00014-76-C-0037)
(AD-A133846; TR-22) Avail: NTIS HC A03/MF A01 CSCL 11/6

The ductility of commercially pure titanium sheet containing either 60, 630, or 980 wt ppm hydrogen has been investigated over deformation paths ranging from uniaxial to equibiaxial tension. Based on measurements of fracture strains measured locally from grids, the data show a decrease in ductility with increasing hydrogen content as the degree of biaxiality of the tensile strain increases. Thus hydrogen embrittlement of Ti sheet depends on deformation path, being the most severe under equibiaxial straining. The embrittlement occurs even though hydrogen has no significant effect on the room temperature yielding and flow behavior of Ti in either uniaxial or balanced biaxial tension. Quantitative metallography indicates that void nucleation is due to hydride fracture and occurs at comparatively small strains in plane strain and equibiaxial deformation. An analysis shows that the strain-induced fracture of the hydrides appears to obey a critical normal stress criterion, the stresses being caused by: (1) the inhomogeneity of strain between the matrix and the particles and (2) the maximum principal stress within the matrix. Calculations show that only the latter changes significantly with loading path, and this is primarily due to the strong degree of plastic anisotropy in the Ti sheet. GRA

N84-14299# McDonnell-Douglas Research Labs., St. Louis, Mo.
INFLUENCE OF RARE-EARTH ADDITIONS ON PROPERTIES OF TITANIUM ALLOYS. EFFECTS OF YTTRIUM AND ERBIUM ADDITIVES ON RAPID SOLIDIFICATION PROCESSING, SUPERPLASTIC FORMING, WELDING, AND STRENGTHENING OF TITANIUM ALLOYS Final Technical Report, 1 Sep. 1980 - 30 Jun. 1982
Shankar M. L. Sastry, T. C. Peng, Richard J. Lederich, and James E. ONeal 31 Jul. 1982 58 p
(Contract N00014-76-C-0626)
(AD-A133669; AD-E401078; MDC-Q0791) Avail: NTIS HC A04/MF A01 CSCL 11/6

Effects of 0.01-2.0 wt% yttrium and erbium additions on rapid solidification processing, superplastic forming, welding, and strengthening of titanium alloys were determined. Ti-8Al-Y and Ti-8Al-Er alloys were rapidly solidified by laser surface melting and electron beam melting and splat-quenching with the objective of simultaneously producing coherent Ti3Al precipitates and incoherent dispersoids. Rapid solidification at cooling rates > 10,000 K/s resulted in 10-100 nm incoherent dispersoids in Ti-8Al-1.5Y and in a nonequilibrium, supersaturated, solid solution Ti-8Al-1.5Si. Dispersoid formation and stability at 700-900 C were studied, and the annealing conditions for the production of a large volume-fraction of fine incoherent dispersoids and of coherent Ti3Al precipitates were determined. Metallic yttrium additions to Ti-6Al-2Nb-1Mo-0.8Ta improved the superplastic formability and increased the strength and ductility of laser weldments. The superposition of solid-solution strengthening, precipitation strengthening, and grain-size strengthening in ingot processed Ti-xAl (x = 4, 5.5, 7.0, 8.5, and 10.0) alloys was studied. GRA

N84-14300# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
DEGRADATION OF FRACTURE TOUGHNESS IN STEELS DUE TO PRIOR STRAIN: A PREDICTIVE MODEL M.S. Thesis
Gregory Benson Sanford Jun. 1983 83 p
(AD-A132600) Avail: NTIS HC A05/MF A01 CSCL 11/6

This thesis quantifies the relationship between prior plastic strain, fracture toughness (J sub Ic), plane strain fracture strain (epsilon sub fps), and yield strength (Q sub y) of HY-series steels at room temperature. Based upon initial J-integral test results of compact tensile specimens that showed a reduction in the fracture toughness with increasing of prestrain, a correlation has been developed where JIc is directly proportional to epsilon sub fps to the fourth power. Thus, small changes in epsilon sub fps will cause large changes in JIc. Further, it has been found that prestrain reduces epsilon sub fps by an amount equal to the prestrain. The combination of these two correlations provides a very simple method of estimating the fracture toughness subsequent to plastic straining. Scanning electron microscopy was used to measure the crack tip stretch zone width (SZW), which is a good estimate of the crack tip strain prior to fracture. The SZW does decrease with increasing prior plastic strain verifying the decrease in epsilon sub fps. GRA

N84-14301# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
THE STRUCTURE AND BEHAVIOR OF VACUUM PLASMA SPRAYED OVERLAY COATINGS ON NICKEL BASED SUPERALLOYS M.S. Thesis
Patrick R. Norton Jun. 1983 49 p
(AD-A132631) Avail: NTIS HC A03/MF A01 CSCL 11/6

The feasibility of using the plasma spray technique for the application of metallic overlay coatings to marine gas turbine components was evaluated. Nickel based superalloy pins were sprayed with various MCrAl coatings using the plasma spray technique, given several types of surface treatments, and then oxidized at 1000 Degrees Centigrade for 100 hours. The effects of the various post-coating treatments on the coating structure and subsequent oxide behavior were investigated. Author (GRA)

N84-14302# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
AN ASSESSMENT OF SELECTED ARMY TECHNICAL MANUALS
Gerald D. Nielsen May 1983 104 p
(AD-A132680; AMSAA-TR-383) Avail: NTIS HC A06/MF A01 CSCL 11/6

Five series of Army technical manuals were examined, and users of these books were interviewed in order to compare objective measurements with user attitudes. Soldiers at several installations expressed their satisfaction with the new Army manual format of proceduralized instructions in simple language accompanied by numerous line drawings. As demonstrated by the UH-60A manuals, technical manuals could be improved by reducing the extent of cross referencing between volumes. Further, it should also be possible to reduce page counts by including more information on each page. Verification of three major Army end items resulted in only approximately 20 percent of maintenance tasks being published without change being required. This shows the continuing need for 100 percent verification of technical manuals. More detailed guidance could improve the verification process. Poor durability of technical manuals is the most frequent user complaint, but this can be substantially improved without incurring unreasonable cost increases. Author (GRA)

N84-14303# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.

AN INVESTIGATION OF SUBSTRATE EFFECTS ON TYPE TWO HOT CORROSION OF MARINE GAS TURBINE MATERIALS M.S. Thesis

Michael J. Shimko Jun. 1983 67 p
(AD-A132833) Avail: NTIS HC A04/MF A01 CSCL 11/6

CoCrAlY coated Modifications of Rene 80 (a Ni base superalloy) were tested for resistance to Type Two (Low Temperature) Hot Corrosion. The effects of Ti and Hf in the substrate (normally 5.0% and 0.0% respectively) and the presence of a Pt underlayer were investigated. Certain trends were distinguishable from the data obtained. Titanium alone was found to be beneficial. Titanium in conjunction with a platinum underlayer was found to be detrimental while platinum underlayers in conjunction with low titanium concentrations in the substrate were found to be beneficial. Hafnium had a noticeable, but irregular effect only on specimens with intermediate titanium concentrations. All the above effects were found to be diffusion related. This study also made certain refinements to the NPS Hot Corrosion Test Program and direct correlation of data obtained from different runs if now justified. GRA

N84-14304# Wisconsin Univ., Madison. Mathematics Research Center.

A FREE-BOUNDARY PROBLEM ARISING FROM A GALVANIZING PROCESS

Thomas I. Vogel Jul. 1983 23 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A132853; MRC-TSR-2540) Avail: NTIS HC A02/MF A01 CSCL 12/1

A free-boundary problem which arises from a galvanizing process is studied. The physical problem is that of an infinite cylinder Omega' x R withdrawn from a fluid bath. Formally, this is a gravity-driven unidirectional viscous fluid flow on the exterior of the cylinder Omega' x R. The existence of a unique classical solution is shown under certain conditions on Omega', and asymptotic results for the thickness of the coat are obtained for large and small withdrawal speeds. If Omega' is a convex set, then the region bounded by the free surface of the fluid is shown to be convex, using level curve techniques. Finally, level curve techniques are used to bound the curvature of the free boundary in terms of that of the fixed boundary. GRA

N84-14305# Naval Postgraduate School, Monterey, Calif.

FATIGUE CRACK GROWTH RATES OF HIGH-MAGNESIUM ALUMINUM-MAGNESIUM ALLOYS AS INFLUENCED BY SOLUTION TREATMENT TIME AND ALLOY CONTENT M.S. Thesis

Kurt D. Oberhofer Jun. 1983 69 p
(AD-A132928; AD-F630031) Avail: NTIS HC A04/MF A01 CSCL 11/6

Test equipment was fabricated and fatigue crack propagation data were obtained for aluminum alloy 7075-T6 and for thermomechanically processed Al-10.2 Wt Pct Mg-0.52 Wt Pct Mn, and Al-8.14 Wt Pct Mg-0.40 Wt Pct Cu alloys. The crack growth data and fractographic information obtained for the 7075-T6 alloy were consistent with data in the literature. The manganese containing alloy was solution treated for nine and twenty-five hour periods. Observed was a decrease in the fatigue crack growth resistance for the longer solutioning time, which appears to be due to the formation and coarsening of Mn Al6 precipitates which fail to dissolve in solution treatment during thermomechanical processing. The copper containing alloy exhibited better crack growth resistance than the 7075-T6 alloy. This alloy has a more diffuse cell structure, relatively little precipitated Mg5Al8, and no constituent particles associated with cell of grain boundaries. Author (GRA)

N84-14306# Purdue Univ., Lafayette, Ind. Thermophysical and Electronic Properties Information Analysis Center.

SPECIFIC HEAT OF BRITISH, CZECHOSLOVAKIAN, FRENCH, GERMAN, JAPANESE, POLISH, ROMANIAN AND SWEDISH STAINLESS STEELS, STATE-OF-THE-ART REPORT

P. D. Desai Aug. 1983 94 p
(Contract DLA900-79-C-1007)
(AD-A132991; TEPIAC/CINDAS-74) Avail: NTIS HC A05/MF A01 CSCL 11/6

This report reviews and presents the numerical data and technical information on the specific heat of 8 British, 2 Czechoslovakian, 2 French, 20 German, 3 Japanese, 2 Polish, 1 Romanian, and 2 Swedish stainless steels. Recommended values for the specific heat of a number of these steels are also given, whenever possible. In many cases, an attempt has been made to match these steels with the equivalent steels having AISI designations. Recommendations of the specific heat values were made in many cases based on the analysis of the data for that particular stainless steel. Validity of the reported data were also checked by comparing them with the data on the equivalent AISI steels and, in a few cases, with the calculated values using the Kopp-Neumann mixing rule. GRA

N84-14307# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.

A MOLECULAR ORBITAL MODEL OF INTERGRANULAR EMBRITTLEMENT Interim Report

M. E. Eberhart, K. H. Johnson, and R. M. Latanision 20 Sep. 1983 16 p
(Contract N00014-81-K-0499)
(AD-A133056; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/2

A current atomistic model for intergranular embrittlement is reviewed. It is argued that this model is incomplete and cannot explain the observed sudden onset of embrittlement at critical grain boundary concentrations of segregated impurities. It is suggested that the existence of chemical bonds lying within the grain boundary and parallel to it would complete the model. SCF-Xalpha-SW molecular orbital calculations have been performed on a cluster designed to model the impurity-impurity interactions within a grain boundary. The results of these calculations indicate that these interactions are present and provide a basis for understanding the qualitative features of intergranular embrittlement. GRA

N84-14308# Sandia Labs., Albuquerque, N. Mex.

CHEMICAL MODIFICATION OF CHEMISORPTIVE AND CATALYTIC PROPERTIES OF NICKEL

D. W. Goodman 1983 26 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract DE-AC04-76DP-000789)
(DE84-002046; SAND-83-1693C; CONF-831174-6) Avail: NTIS HC A03/MF A01

Several reactions representing important categories of catalytic systems were studied on chemically modified single crystal surfaces: methanation of CO and CO2, hydrogenolysis of ethane; hydrogenation of ethylene and cyclopropane ring-opening; and hydrogenolysis. Poisoning of the above reactions by ordered, submonolayer coverages of sulfur show large nonlinear effects for sulfur coverages versus reactivity attenuation. These data together with related chemisorption results are reviewed with emphasis on the methanation reaction. Related studies address the role of potassium promoters in nickel catalysts for methanation. Potassium decreases the rate of methane formation and increases the rate of higher hydrocarbons relative to the clean nickel surface. Similar results reported for supported nickel catalysts suggest that support effects play a small role in catalytic promotion by potassium. DOE

N84-14309# Oak Ridge National Lab., Tenn. Metals Preparation Div.

MECHANICAL-PROPERTY CHARACTERIZATION OF AN ELECTROSLAG-CAST VALVE BODY OF CF8M COMPOSITION

Y. L. Hotsur and V. K. Sikka Nov. 1983 67 p refs
(Contract W-7405-eng-26)
(DE84-002253; ORNL/TM-8854) Avail: NTIS HC A04/MF A01

An electroslag cast, type 316 stainless steel (CF8M) valve body section subjected to tensile, creep, Charpy V-notch, and microhardness testing as well as an optical metallography, scanning electron microscopy, and transmission electron microscopy.

Mechanical testing was conducted on specimens from three levels of the casting in both the longitudinal and transverse directions. Comparisons made between the as-cast and solution-annealed specimens indicate that annealed specimens (in most cases) have better mechanical properties. This can be attributed to the dissolution of precipitated Fe-Cr-Mo microconstituents (sigma, chi, metal carbides, etc.) during the solution treatment. In general, though, preliminary results show that the electroslag castings have properties competitive with those of conventional sand castings.
DOE

N84-14310# Los Alamos Scientific Lab., N. Mex.
NOVEL HARD METAL COMPOSITIONS AND PROPERTIES
Haskell Sheinberg 1983 26 p refs Presented at the 3rd Intern. School of Sintered Mater., New Delhi, 6-9 Dec. 1983
(Contract W-7405-eng-36)
(DE84-001736; LA-UR-83-3045; CONF-831246-1) Avail: NTIS HC A03/MF A01

A new family of hard metal compositions consisting primarily of borides, borocarbides and carbides of nickel, iron and tungsten or molybdenum is made by reaction with small quantities of boron carbide. The hardness of these compositions is in the range of the hardest conventional tungsten carbide-cobalt compositions. Density of this family of materials is varied from about 8 to 17 Mg/m(3) with only slight variations in hardness. Preliminary data on hot hardness, hardness, fracture toughness, and abrasion resistance are encouraging.
DOE

N84-14311# Sandia Labs., Albuquerque, N. Mex.
MEASUREMENT OF PRECIPITATE NUCLEATION TIMES IN MOLTEN METALS BY PULSED SURFACE MELTING
D. M. Follstaedt, S. T. Picraux, P. S. Peercy, J. A. Knapp, and W. R. Wampler 1983 7 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract DE-AC04-76DP-00789)
(DE84-002383; SAND-83-1254C; CONF-831174-5) Avail: NTIS HC A02/MF A01

The short melt duration resulting from pulsed laser and electron beam surface melting of ion-inplanted metals was used to measure precipitate nucleation times of compounds within the melt. The phases present in several alloy systems were examined with TEM and calculated thermal histories were used to place limits on the time required for nucleation of the following compounds: AlSb (5 to 25 ns), Al3Ni (greater than or equal to 750 ns), Al3Ni2 (greater than or equal to 950 ns) and AlNi (< 1000 ns), all in molten Al, and TiC (less than or equal to 100 ns) in molten Fe. The compounds observed after rapid solidification have relatively simple, cubic structures and melt congruently, while those predicted but not observed have more complex structures and decompose peritectically.
DOE

N84-14312# Oak Ridge National Lab., Tenn.
SOLIDIFICATION AND PHASE STABILITY IN AUSTENITIC STAINLESS STEELS
J. E. Cunningham 1983 9 p refs Presented at DOE Mater. Directors' Meeting, Los Alamos, N. Mex., 19 Oct. 1983
(Contract W-7405-eng-26)
(DE84-001937; CONF-8310203-1) Avail: NTIS HC A02/MF A01

The weldability of austenitic stainless steel continues to be of great interest. Solidification and phase stability in this class of materials was investigated. Their initial thrust centered on the use of higher rates of solidification, such as encountered in laser welding, and characterization of the resulting microstructures. The formation of sigma phase, especially the role of sigma phase in degrading material performance under load in service was examined. This report highlights the results of their work. DOE

N84-14313# Oak Ridge National Lab., Tenn.
TRANSPORT PROPERTIES OF POLYCRYSTALLINE NI3AI
R. K. Williams, F. J. Weaver, and R. S. Graves 1983 17 p refs Presented at 18th Intern. Thermal Conductivity Conf., Rapid City, S. D., 3 Oct. 1983
(Contract W-7405-eng-26)
(DE84-001969; CONF-8310163-5) Avail: NTIS HC A02/MF A01

The room temperature electrical and thermal conductivities of annealed high purity samples containing 74 to 76 at.% Ni are presented. Residual (4.20K) electrical resistivity data are employed in the analysis and show a pronounced minimum at the stoichiometric composition. It is shown that the thermal conductivity of this compound is quite sensitive to stoichiometry and, at room temperature, has a maximum value at about 74.8 at.% Ni. Calculated and experimentally derived phonon thermal conductivity values agree well, and indicated that this carrier is responsible for about 25% of the room temperature thermal conductivity. The electronic Lorenz function is essentially equal to the Sommerfeld value.
DOE

N84-14314# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
FATIGUE OF NIOBIUM AT ELEVATED TEMPERATURES
N. S. Stoloff, P. Xiao, and R. Choudhury 1 Jun. 1983 35 p refs Presented at Fatigue and Corrosion Fatigue Meeting, Montreal, 1 Jun. 1983
(Contract DE-AC02-76ER-03459)
(DE84-001373; DOE/ER-03459/18; CONF-8306138-1) Avail: NTIS HC A03/MF A01

High cycle and low cycle fatigue behavior of unalloyed niobium was studied between room temperature and 8000C. High cycle lives decrease monotonically in vacuum with temperature to 8000C. Low cycle fatigue lives in argon increase with temperature between 450 and 6500C. Frequency effects on LCF are small in this range. Hold times imposed at peak loads also increases fatigue lives and the number of cycles to crack initiation in this temperature range. A transition from striated to dimpled fracture surfaces with increasing temperature for HCF specimens was noted. The LCF specimens display large striations at 450 and 550 and extensive slip at 6500C. Impurities in argon used for LCF tests appear to be responsible for extensive surface cracking.
DOE

N84-14315# Hanford Engineering Development Lab., Richland, Wash.
FACTORS WHICH DETERMINE THE SWELLING RATE OF AUSTENITIC STAINLESS STEELS
F. A. Garner and W. G. Wolfer (Wisconsin Univ.) 1983 7 p refs Presented at the 3rd Top. Meeting on Fusion Reactor Mater., Albuquerque, N. Mex., 19-23 Sep. 1983
(Contract DE-AC06-76FF-02170)
(DE84-001474; HEDL-SA-2896; CONF-830942-56) Avail: NTIS HC A02/MF A01

Once void nucleation subsides, the swelling rate of many austenitic alloys becomes rather insensitive to variables that control the transient regime of swelling. Models are presented which describe the roles of nickel, chromium and silicon in void nucleation. The relative insensitivity of steady-state swelling to temperature, displacement rate and composition is also discussed.
DOE

N84-14316# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
APPROXIMATE LINEAR STABILITY ANALYSIS OF A MODEL OF ADIABATIC SHEAR-BAND FORMATION
Timothy J. Burns Oct. 1983 41 p refs
(Contract DE-AC04-76DP-00789)
(DE84-001918; SAND-33-1907) Avail: NTIS HC A03/MF A01

The formation of adiabatic shear bands in ductile metals under dynamic loading conditions is generally thought to result from a material instability, which is associated with a peak in the curve of engineering plastic flow stress vs engineering shear strain. This instability arises from the effect of thermal softening, caused by irreversible adiabatic heating, which counteracts the tendency of the material to harden with increasing plastic strain. An approximate linear stability analysis of a one dimensional rigid thermoviscoplastic model, based on data taken from dynamic torsion experiments on thin walled tubes of mild steel, shows that shear band formation in this situation can be interpreted as a bifurcation from a homogeneous simple shearing deformation which occurs at the peak in the homogeneous stress vs strain curve. The asymptotic method of multiple scales is used to show that the growth rate of small perturbations on the homogeneous deformation is controlled by the ratio of the slope of the homogeneous stress vs strain curve to the material viscosity, i.e., the rate of change of the plastic flow stress with respect to the strain rate. DOE

N84-14317# California Univ., Livermore. Lawrence Livermore Lab.
METALLURGICAL EXPLANATION OF DOUBLE MAGNETIC TRANSITIONS AND ALLIED PHENOMENA IN AuFe ALLOYS
R. J. Borg and C. E. Violet 1 Sep. 1983 12 p refs Presented at the Ann. Conf. on Magnetism and Magnetic Mater., Pittsburgh, 8-11 Nov. 1983
(Contract W-7405-eng-48)
(DE84-002024; UCRL-89424; CONF-831187-8) Avail: NTIS HC A02/MF A01

Evidence for two magnetic ordering temperatures in AuFe alloys (0.1 < X sub Fe < .25) is given by a.c. and static susceptibility measurements and Moessbauer experiments. These data gave rise to a variety of qualitative theories based upon fluctuations in the random distribution of Fe atoms. An explanation of the two ordering temperatures is based upon the precipitation of a metastable Fe enriched phase which arises via a spinodal decomposition and which magnetically couples to the spin glass matrix. The high temperature transition denotes the onset of ferromagnetic order within the precipitate whose field is then locally coupled to the paramagnetic matrix. When the temperature of the system is decreased below the spin glass ordering temperature the apparent high temperature ferromagnetic character is destroyed, attesting to the dominance of the random spin glass structure and the strength of the coupling between the two phases. Hence, it is the temperature dependence of the coupling between distinguishable phases as well as the nature of the magnetic order which produces the double transition. DOE

N84-14318# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
CONSTITUTIVE EQUATIONS FOR THE CREEP BEHAVIOR OF NICKEL-BASE ALLOYS FOR HIGH TEMPERATURE REACTOR (HTR) COMPONENTS IN THE TEMPERATURE RANGE 1023-1273 K Thesis - Technische Hochschule, Aachen
W. Osthoff, H. Schuster, P. J. Ennis, and H. Nickel Apr. 1983 169 p refs In GERMAN; ENGLISH summary
(JUEL-1843; ISSN-0366-0885) Avail: NTIS HC A08/MF A01

Applicability and modification of constitutive equations for creep and relaxation behavior are described. Creep tests in the stress range 10 to 150 Mega Pascal (MPa) at temperatures 1023 to 1273K were carried out. Dislocation climb was the dominant deformation mechanism. Internal stress dependence on creep strain, applied stress, deformation prior to testing, temperature and alloy composition was determined. Relaxation and stress dip tests show two separate time dependent relationships for the reduction of stress or anelastic backstrain. A rapid decrease at the start of the test due to back glide of dislocations and a much slower decrease associated with recovery are observed. Calculation of the stress relaxation behavior based on the Norton creep law leads to a time dependence different from experimental results. However, taking into account the decreasing internal stress during the relaxation test due to recovery processes, it is possible to describe satisfactorily the experimentally determined relaxation curves. Author (ESA)

N84-14319# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
CARBIDE PRECIPITATION IN NICKEL-BASE MODEL ALLOYS AND ITS INFLUENCE ON DUCTILITY AND FRACTURE BEHAVIOR AT ROOM TEMPERATURE Thesis - Technische Hochschule Aachen
K. P. Mohr, H. Schuster, and H. Nickel May 1983 205 p refs In GERMAN; ENGLISH summary
(JUEL-1845; ISSN-0366-0885) Avail: NTIS HC A10/MF A01

Influence of carburization on tensile properties of nickel-base model alloys at room temperature is studied. The relationship between carbide volume fraction and ductility loss was emphasized. Light-optical tests, quantitative image analysis, metallographic etching methods, X-ray structure analysis and electron beam/microprobe analysis were applied. The embrittlement is severe for volume fractions > 3% if the carbides are formed on grain and twin boundaries. Cracks are propagated unhindered in continuous, grain boundary carbide films. Noncontinuous boundary carbide precipitates lead to less severe ductility loss. Intracrystalline carbide precipitates reduce the ductility only slightly due to the presence of ductile matrix. The relationship between the 0.2% proof stress and the carbide volume fraction is described using a rule of mixtures, but the tensile strength and the true rupture elongation can not be satisfactorily described without consideration of crack growth by linkage of pores between fractured carbide particles. Author (ESA)

N84-14320# National Bureau of Standards, Boulder, Colo.
MATERIALS STUDIES FOR MAGNETIC FUSION ENERGY APPLICATIONS AT LOW TEMPERATURES, PART 6
R. P. Reed and N. J. Simon May 1983 434 p refs Sponsored in part by DOE
(PB83-259630; NBSIR-83-1690) Avail: NTIS HC A19/MF A01 CSCL 11F

Results of a research program to produce material property data that will facilitate design and development of cryogenic structures for the superconducting magnets of magnetic fusion energy power plants and prototypes are contained. The sixth year of work on the low-temperature materials research program is summarized. Highlights of the results are presented first. Research results are given for the four main program areas: structural alloys, weldments and castings, nonmetallics, and technology transfer. Objectives, approaches, and achievements are summarized in an introduction to each program area. The major portion of the program was evaluation of the low-temperature mechanical and physical properties of stainless steel base metals, welds, and castings, with particular emphasis on the nitrogen-strengthened stainless steels. Developmental steels with manganese additions are also under investigation. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-14321 Illinois Inst. of Tech., Chicago.
SURFACE EMBRITTLEMENT OF DUCTILE POLYMERS: A FRACTURE MECHANICS APPROACH Ph.D. Thesis
Loic Rolland 1983 237 p
Avail: Univ. Microfilms Order No. DA8317239

The surface embrittlement of ductile polymers is explained using fracture mechanics principles. From fracture mechanics principles it is shown that the resistance of a polymer to surface embrittlement is greater then its crack arrest toughness. Further, it is predicted that the necessary and sufficient condition for a brittle layer to be able to embrittle a ductile polymer is that the value of the stress intensity factor at the ductile brittle interface during dynamic crack growth be greater than the crack arrest toughness in the ductile material. This hypothesis was verified by modeling the surface embrittlement process. A brittle material-ductile material duplex specimen was designed. Measurements of crack velocity using this specimen showed that there is a critical crack velocity, V sub c, above which the crack propagates through the interface and below which it arrests at the interface. The values V sub c obtained using the duplex specimen were the same as those determined from the respective a vs. K curves of the brittle and the ductile material. Dissert. Abstr.

N84-14322* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELASTOMER-MODIFIED PHOSPHORUS-CONTAINING IMIDE

RESINS Patent
Indra K. Varma (NAS-NRC, Washington, D.C.), George M. Fohlen (NAS-NRC, Washington, D.C.), and John A. Parker, inventors (to NASA) (NAS-NRC, Washington, D.C.) Issued 20 Dec. 1983 8 p
Filed 15 Nov. 1982 Supersedes N83-14276 (21 - 05, p 0643)
Sponsored by NASA
(NASA-Case-ARC-11400-1; US-Patent-4,421,820;
US-Patent-Appl-SN-441899; US-Patent-Class-428-246;
US-Patent-Class-524-494; US-Patent-Class-524-496;
US-Patent-Class-524-500; US-Patent-Class-524-530;
US-Patent-Class-525-282; US-Patent-Class-525-287;
US-Patent-Class-428-260; US-Patent-Class-428-367;
US-Patent-Class-428-408; US-Patent-Class-428-473.5;
US-Patent-Class-428-902; US-Patent-Class-428-920) Avail: US Patent and Trademark Office CSCL 11G

Phosphine oxide-containing polyimide resins modified by elastomers, are disclosed which have improved mechanical properties. These products are particularly useful in the production of fiber or fabric-reinforced composites or laminates.
Official Gazette of the U.S. Patent and Trademark Office

N84-14323* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HOT MELT RECHARGE SYSTEM Patent
Donald J. Progar, inventor (to NASA) Issued 13 Dec. 1983 7 p
Filed 24 Mar. 1982 Supersedes N82-26464 (20 - 17, p 2381)
(NASA-Case-LAR-12881-1; US-Patent-4,420,518;
US-Patent-Appl-SN-361215; US-Patent-Class-428-40;
US-Patent-Class-428-78; US-Patent-Class-428-202;
US-Patent-Class-428-347; US-Patent-Class-206-447;
US-Patent-Class-206-582) Avail: US Patent and Trademark Office CSCL 11A

A package assembly is described for pecisely positioning a charge of hot melt adhesive onto an attachment pad or point of use. The adhesive is heated to softening or melt temperature (280 F to 325 F) and thereafter cooled to resolidifying temperature. A single sided pressure sensitive polyimide film tape serves with another film strip to protect a sandwiched adhesive strip until use and to hold the adhesive in precise position until thermally bonded to its point of use. Tab ends serve as aids in stripping tapes and from the adhesive charge.
Official Gazette of the U.S. Patent and Trademark Office

N84-14324* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HEAT SEALABLE, FLAME AND ABRASION RESISTANT COATED FABRIC Patent
Richard P. Tschirch (Little (Arthur D.), Inc., Cambridge, Mass.) and Kenneth R. Sidman, inventors (to NASA) (Little, (Arthur D.), Inc., Cambridge, Mass.) Issued 26 Jul. 1983 6 p Filed 6 Mar. 1981 Supersedes N82-24344 (20 - 15, p 2066) Division of US-Patent-Appl-SN-145107, US-Patent-4,284,682, filed 30 Apr. 1980 Sponsored by NASA
(NASA-Case-MSC-18382-2; US-Patent-4,395,511;
US-Patent-Appl-SN-241155; US-Patent-Class-524-371) Avail: US Patent and Trademark Office CSCL 11G

Flame retardant, abrasion resistant elastomeric compositions are disclosed which are comprised of thermoplastic polyurethane polymer and flame retarding amounts of a filler selected from decabromodiphenyloxide and antimony oxide in a 3:1 weight ratio, and decabromodiphenyloxide, antimony oxide, and ammonium polyphosphate in a 3:1:3 weight ratio respectively. Heat sealable coated fabrics employing such elastomeric compositions as coating film are produced by dissolving the elastomeric composition to form a solution, casting the solution onto a release paper and drying it to form an elastomeric film. The film is then bonded to a woven, knitted, or felted fabric.
Official Gazette of the U.S. Patent and Trademark Office

N84-14325# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va.
IDENTIFICATION AND CHARACTERIZATION OF ELASTOMER VULCANIZATE MATERIALS USING PYROLYTIC GAS LIQUID PHASE CHROMATOGRAPHY Final Report
Robert G. Jamison Apr. 1983 21 p
(DA Proj. 1L1-62733-AH-20)
(AD-A134056; MERADCOM-2383) Avail: NTIS HC A02/MF A01 CSCL 11/10

The objective of this program was to develop a capability differentiating between different types of elastomer vulcanizate currently used in military vehicles and equipment systems including those commonly found in tank hydraulic and gun control systems. The results of this study show that the proposed method can be used to determine the exact type of elastomer polymer and, thereby, can assure that the proper elastomer components are used in the system intended for use. Author (GRA)

N84-14326# Department of the Navy, Washington, D. C.
AN ASSESSMENT OF ABLATIVE ORGANOTIN ANTIFOULING (AF) COATINGS
Theodore Dowd 1983 6 p
(AD-A134019; AD-F300328) Avail: NTIS HC A02/MF A01 CSCL 11/3

The widely used cuprous oxide antifouling paints are no longer able to meet the increasing demands of the Marine industry. Now that fuel and drydocking costs have soared, the Marine industry is looking for antifouling paints that will permit extended drydocking intervals and to perform foul-free between dockings to keep fuel costs to a minimum and in addition, to eliminate the costly underwater mechanical brushing. The new ablative antifouling coatings enable ship owners to achieve these results with organotin toxicants. The Marine industry, including the U.S. Navy and Coast Guard are beginning to obtain foul-free underwater hulls of up to four years, and the clean hulls have produced a ten percent fuel savings per ship per year. In addition, the inherent, self-cleaning action has completely eliminated the expense of underwater brushing and the ensuing damage suffered by the antifouling coating by the mechanical process. The U.S. Navy is investigating these ablative coatings and comparing its findings with those obtained on ships in the commercial sector. The overall results show a very close correlation regarding fuel savings and foul-free performance over longer drydocking intervals. GRA

N84-14327# National Bureau of Standards, Washington, D.C.
EFFECT OF CONTACT DAMAGE ON THE STRENGTH OF CERAMIC MATERIALS
Brain R. Lawn, S. M. Wiederhorn, B. J. Hockey, R. F. Cook, and H. Richter Oct. 1983 177 p
(Contract N00014-81-F-0002)
(AD-A133746) Avail: NTIS HC A09/MF A01 CSCL 11/2

Contents: Indentation Analysis: Applications in the Strength and Wear of Brittle Materials; Dynamic Fatigue of Brittle Materials Containing Indentation Line Flaws; Controlled Indentation Flaws for Construction of Toughness and Fatigue Master Maps; Fatigue Properties of Ceramics with Natural and Controlled Flaws: A Study on Alumina; Subthreshold Indentation Flaws in the Study of Fatigue Properties of Ultra-High Strength Glass; Kinetics of Shear-Activated Indentation Crack Initiation in Soda-Lime Glass; Universal Fatigue Curves for Ceramics Using Indentation Flaws; and A Modified Indentation Toughness Technique. GRA

N84-14328# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
AIRCRAFT WATER-BASED SOLID FILM LUBRICANTS Final Report
Alfeo A. Conte, Jr. 10 Jun. 1983 28 p
(F61542)
(AD-A133732; NADC-83059-60) Avail: NTIS HC A03/MF A01 CSCL 11/8

An improved MIL-L-81329 water based extreme temperature range solid film lubricant has been developed. This material provides corrosion protection and improved endurance life for steel on steel components while maintaining the other desirable properties such as oxidation resistance. An upgraded specification covering the properties of this material, which is designated 23C, is provided in appendix A. The goals of this program were twofold;

1) to develop a high temperature water resistant solid film lubricant based on lithium silicate; and 2) to develop a water based non-polluting solid film lubricant to replace MIL-L-8937 for moderate temperature applications. It was found that although lithium silicate films are resistant to solvation by water they are more permeable than sodium silicate films and thus allow corrosion of steel substrates to proceed at a faster rate. The addition inorganic nitrites as corrosion inhibitors causes an instability of the lithium silicate, with SiO2 precipitating immediately. For the moderate temperature range application of MIL-L-8937, solid film lubricants containing water soluble resins were studied. The best material studies showed an endurance life of only one half that of MIL-L-8937. The use of an experimental strategy technique was found very beneficial in determining optimum composition ranges with a minimal amount of experimentation. Author (GRA)

N84-14329# Texas A&M Univ., College Station. Dept. of Chemistry.
MACROCYCLES CONTAINING TIN. SYNTHESES OF SYMMETRICAL MACROCYCLES CONTAINING 2 OR 4 DIPHENYLSTANNA UNITS
Martin Newcomb and Yutaka Azuma 7 Oct. 1983 28 p
(Contract N00014-79-C-0584; NR Proj. 053-714)
(AD-A133697; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/3

The syntheses of macrocycles containing two diphenylstanna moieties, cyclo-(Ph2Sn(CH2)n-)2 (1, n = 4, 5, 6, 8, 10, 12), and four diphenylstanna moieties, cyclo-(Ph2Sn(CH2)n (-)4 (2, same n)), are reported. Alpha, omega-bis (Bromomagnnesio)alkanes reacted with Ph3SnC1 to give alpha, omega-bis(triphenylstannyl) alkanes which upon treatment with HBr gave alpha, omega-bis (bromodiphenylstannyl)alkanes (4). Compounds 4 reacted with the corresponding chain length alpha, omega-bis(bromomagnesio) alkanes to give 1 and 2. Alternatively, good yields of 1 (n = 4, 5, 6, 8) were obtained by converting 4 to dilithium reagents (7) which were allowed to react with alpha, omega-dibromoalkanes. Good yields of 2 (n = 4, 5, 6) were obtained by first treating 4 with C1(CH2) MgBr to give dichlorides which were then allowed to react with 7 in a second step. Purifications of the macrocyles and several synthetic intermediates were effected by preparative reverse phase chromatography. The macrocyclic products were characterized by NMR spectroscopy, molecular weight determinations and elemental analyses. GRA

N84-14330# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
SMALL-ANGLE X-RAY SCATTERING STUDY OF MICELLE FORMATION IN MIXTURES OF BUTADIENE HOMOPOLYMER AND STYRENE-BUTADIENE BLOCK COPOLYMER
D. Rigby and R. J. Roe 1 Oct. 1983 45 p Submitted for publication
(Contract N00014-77-C-0376; NR Proj. 356-655)
(AD-A133645; TR-9) Avail: NTIS HC A03/MF A01 CSCL 07/3

The small-angle X-ray scattering technique is utilized to study the formation of micelles in mixtures containing polybutadiene homopolymer (Mn = 2350) with much smaller amounts (0.5 to 8 wt%) of styrene-butadiene diblock copolymer (Mn = 25000, 52.2 wt% styrene). The following quantities, characterizing the structure of the micelle core consisting of styrene blocks swollen with polybutadiene, have been evaluated as a function of temperature and the copolymer concentration: the radius of gyration of the core, the degree of swelling of the core, the number of block copolymer molecules forming a micelle, and the volume of a core. In addition, the critical micelle concentration (i.e., the minimum copolymer concentration necessary for micelle formation) and the number density of micelles as a function of the concentration were also determined. The degree of swelling of micelle cores by polybutadiene increases steadily with increasing temperature. The micelle core size is fairly independent of the concentration and, as the temperature is raised, at first remains unchanged but then increases rapidly before it finally dissolves completely. The temperature of dissolution increases with concentration of the copolymer. The micelle core volumes, determined by two independent methods (one by the Guinier analysis and the other from the ratio I(O)/Q), agree well with each other. GRA

N84-14331# National Bureau of Standards, Washington, D.C. Polymer Science and Standards Div.
TEMPERATURE DEPENDENT HYSTERESIS STUDY IN POLYVINYLIDENE FLUORIDE
R. B. Olsen, J. C. Hicks, M. G. Broadhurst, and G. T. Davis 22 Aug. 1983 19 p
(Contract N00014-83-F-0013)
(AD-A132675; TR-19) Avail: NTIS HC A02/MF A01 CSCL 11/9

An experimental study of temperature dependent ferroelectric hysteresis phenomena of polyvinylidene fluoride is presented. The temperature dependence of the remanent polarization and coercive field was measured from saturated ferroelectric hysteresis curves with a temperature range from 60 degrees C to 130 degrees C. This data was then compared to a 2-site and 6-site ferroelectric switching model. GRA

N84-14332# National Bureau of Standards, Washington, D.C. Polymer Science and Standards Div.
RIGOROUS BOUNDS FOR THE CALCULATED DIELECTRIC CONSTANTS OF FERROELECTRIC POLYMERS
Martin G. Broadhurst Aug. 1983 14 p
(Contract N00014-83-F-0013)
(AD-A132741; TR-21) Avail: NTIS HC A02/MF A01 CSCL 20/12

A theory is presented for calculating rigorous upper and lower bounds for the dielectric constant of a semicrystalline polymer in terms of the volume fraction of crystalline phase, the dielectric constant of the liquid phase and the anisotropic dielectric tensor of the crystalline phase. Also required are two orientation functions (cos to the 2nd power theta) and (cos to the 2nd power alpha) where theta defines the tilt of crystal lamellae and alpha the orientation of the electric moment of each crystal with respect to the measuring field. Bounds are presented for polyvinylidene fluoride for a variety of orientations. GRA

N84-14333# Case Western Reserve Univ., Cleveland, Ohio.
IMPROVED MOISTURE RESISTANCE OF FIBER REINFORCED PLASTICS Final Report, 12 Apr. 1982 - 11 Apr. 1983
Jack L. Koenig 30 Aug. 1983 3 p
(Contract DAAG29-82-K-0100)
(AD-A132762; ARO-18628.6-MS) Avail: NTIS HC A02/MF A01 CSCL 11/9

The effect of coupling agent on the performance of glass fiber composites has been investigated from the mechanical and molecular viewpoint. GRA

N84-14334# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
HOMOGENIZING PROPERTIES OF DIBLOCK POLYMERS IN BLENDS OF CORRESPONDING HOMOPOLYMERS
Mark A. Hartney and Robert E. Cohen 22 Aug. 1983 38 p
(Contract N00014-77-C-0311; NR Proj. 356-646)
(AD-A132832; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/3

A series of blends was prepared form homopolymers and diblock coploymers of 1,2-polybutadiene and 1,4-polybutadiene. Samples were studied by dynamic mechanical analysis and transmission electron microscopy to determine whether a homogeneous or heterogeneous morphology existed. Although blends of the homopolymers exhibit phase separation, inclusion of an appropriate amount of a diblock polymer can lead to a homogeneous morphology. The materials examined covered a wide range of molecular weight, composition, and diblock copolymer fraction in the blend, enabling an experimental phase diagram to be determined. These findings are compared with current theories of phase behavior for blends of diblock copolymers and homopolymers. Author (GRA)

N84-14335# National Bureau of Standards, Washington, D.C. Polymer Science and Standards Div.
PRE-EXISTING POLARIZATION AND INFLUENCE OF ELECTRODE MATERIALS ON PVF2 ELECTRETS AS DETERMINED BY THERMAL PULSE AND PYROELECTRIC METHODS
Aime S. DeReggi, Frederick I. Mopsik, Martin G. Broadhurst, and Sidney B. Lang Aug. 1983 24 p
(Contract N00014-83-F-0013)
(AD-A132896; TR-20) Avail: NTIS HC A02/MF A01 CSCL 20/3

A number of polyvinylidene fluoride (PVF2) electrets were prepared with different permutations of gold and aluminum electrodes and poled with dc fields up to 160 MV per m at room temperature. Polarization distributions were measured by the thermal pulse method and pyroelectric coefficients were determined. Quantitative measurements were made of a significant level of polarization in nominally unpoled PVF2 and a contact electrification mechanism was proposed. No consistent effects of electrode materials on polarization distribution were found. PVF2 poled at room temperature has its highest polarization near the center of the thickness in contrast to the results on samples poled at elevated temperatures and cooled inhomogeneously with the field applied. Author (GRA)

N84-14336# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
SPECTROSCOPIC CHARACTERIZATION OF THE CURED STATE OF ACETYLENE-TERMINATED RESIN Final Report, 1 Apr. 1982 - 31 Mar. 1983
Jack L. Koenig Wright-Patterson AFB, Ohio AFWAL Aug. 1983 70 p
(Contract F33615-82-K-5038; AF Proj. ILIR)
(AD-A133050; AFWAL-TR-83-4064) Avail: NTIS HC A04/MF A01 CSCL 11/9

The acetylene-terminated resin, bis 4-(3-ethynylphenoxy)phenyl sulfone (AT) hs ben studied using Fourier transform infrared spectroscopy (FT-IR) and high resolution nuclear magnetic resonance spectroscopy of solids. Samples which were cured at different temperatures for various times were analyzed by FT-IR and the results interpreted using factor analysis. The analysis revealed that only two major components were involved in the curing mechanism, that is, only a single polymerization reaction occurred at low curing temperatures. The pure component spectra generated by the factor analysis procedure could be used to analyze the state of cure of the resin. The infrared spectrum of the polymer is consistent with a polydiene structure. The NMR results produced a similar structural result. The extent of cure of the AT resin as evidence by the disappearance of the acetylene carbon followed a similar path to the infrared results. Curve studies also focussed on the effect of high temperature post cures of the ATS resin. Structural changes were reflected by spectroscopic differences but the changes were small and precise assignments were not possible. Further model compound studies would allow a precise determination of the structural basis of these spectroscopic differences. GRA

N84-14337# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
HOMOPOLYMER-INDUCED MICROPHASE SEPARATION OF A HOMOGENEOUS DIBLOCK COPOLYMER
Robert E. Cohen and Jose M. Torradas 29 Aug. 1983 14 p
(Contract N00014-77-C-0311)
(AD-A133069; TR-11) Avail: NTIS HC A02/MF A01 CSCL 07/3

Binary polymer blends were prepared from a homogeneous diblock copolymer (1,2 polybutadiene-1,4 polybutadiene) and either of the corresponding homopolymers. Using dynamic mechanical testing and transmission electron microscopy it was shown that the 1,4B homopolymer and the copolymer form homogeneous blends; however, addition of 1,2B homopolymer induces a heterogeneous morphology when present in sufficient proportions. The nature of this homopolymer-induced microphase separation is compared to predictions of a recent theory. GRA

N84-14338# Goodrich (B. F.) Co., Akron, Ohio.
LINEAR AND NONLINEAR VISCOELASTIC CONSTITUTIVE RELATIONS OF CORD REINFORCED ELASTOMERS
F. Tabaddor and S. K. Clark (Michigan Univ., Ann Arbor) 1983 9 p refs Presented at the Intern. Conf. on Constitutive Laws for Eng. Mater.: Theory and Appl., Tucson, Ariz., 10 Jan. 1983
(Contract DE-AC02-80ER-10735)
(DE84-002371; CONF-830104-6) Avail: NTIS HC A02/MF A01

The definition of effective constitutive laws of advanced composites is re-examined and the theoretical limitations of such definition are discussed for Elastic and Viscoelastic Constitutive Laws of Cord Reinforced Rubber Composites. The theoretical models for calculating the viscoelastic energy loss characteristics of these composites are then discussed. These characteristics generally defy closed form solutions and hence are obtained numerically. The numerical procedures and numerical results are discussed and compared with data obtained from an extensive experimental program. DOE

N84-14339# California Univ., Livermore. Lawrence Livermore Lab.
FABRICATION OF SiC, Si3N4 AND AIN COMBUSTION SYNTHESIS
J. B. Holt and Z. A. Munir 6 Oct. 1983 9 p refs Presented at the Intern. Symp. on Ceramic Components for Engines, Hakone, Japan, 17 Oct. 1983
(Contract W-7405-eng-48)
(DE84-001766; UCRL-88966; CONF-8310183-1) Avail: NTIS HC A02/MF A01

Combustion synthesis is a process which takes advantage of the high exothermic heat of many chemical reactions to form refractory compounds. Borides, carbides, and nitrides are a technologically important group of refractory materials. The new process is especially suited to form these compounds. The thermodynamic and kinetic factors of the high temperature, self-propagating reactions are viral to the selection of suitable systems and optimization of the final product. It is important to understand the synthesis of SiC, Si3N4, and AIN by these combustion processes. The experimental difficulty in forming SiC is entirely different than for Si3N4 and AIN. The potential for this method of fabrication and the various procedures for using combustion synthesis is discussed. DOE

N84-14340# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
GLASS-LIKE CARBON: A C/SUB x/H POLYMER INTERCALATION COMPOUND
R. H. Bragg May 1983 11 p refs Presented at 3rd Intern. Conf. on Graphite Intercalation Compounds, Pont-a-Moussan, France, 23 May 1983
(Contract DE-AC03-76SF-00098)
(DE84-001863; LBL-16615; CONF-8305143-1) Avail: NTIS HC A02/MF A01

The structure and annealing behavior of glass like carbon show that it is a polymer carbon but similar to other carbons. The X-ray and neutron diffraction indicate a crystallite size of 2.0 to 5.0 nm, but lattice fringe images show continuous interwould laths made up of 5 to 10 layers of graphite planes. During heating above 20000C, the interlayer spacing decreases, hydrogen is removed, and the sign of the Hall coefficient changes. It is proposed that these phenomena indicate deintercalation of hydrogen from an intercalation compound of stage 1 composition C3H. DOE

N84-14341# Mound Lab., Miamisburg, Ohio.
DIFFUSION PROPERTIES AND PHASE TRANSITIONS OF THE METALIC GLASS a-Zr2-PdH-x
R. C. Bowman, Jr., J. S. Cantrell (Miami Univ., Oxford, Ohio), A. Attalla, D. E. Etter, B. D. Craft, J. E. Wagner (Miami Univ., Oxford, Ohio), and W. L. Johnson (California Inst. of Tech., Pasadena) 1983 6 p refs
(Contract DE-AC04-76DP-00053)
(DE83-016626; MLM-3081(OP); CONF-830888-6) Avail: NTIS HC A02/MF A01

Nuclear magnetic resonance measurements were made to deduce hydrogen diffusion parameters in amorphous a-Zr2PdH2.9. Non-Arrhenius temperature dependence as well as enhanced hydrogen mobility was found for glassy a-r2PdH2.9 in contrast to the Arrhenius behavior in two crystalline c-Zr2PdH2.9 0 phases. Differential scanning calorimetry and X-ray diffraction indicate that both the initial a-Zr2Pd alloy and the amorphous hydride undergo irreversible transformations at elevated temperatures. Although a-Zr2Pd forms the crystalline intermetallic, a-Zr2PdH2.9 can generate either crystalline Zr2PdH sub x or ZrH sub x as the major decomposition product. DOE

N84-14342# Technische Hochschule, Aachen (West Germany). Inst. fuer Kunststoffverarbeitung.
POLYESTER FIBER REINFORCEMENT OF THERMOSETTING MOLDING COMPOUNDS Final Report, Jun. 1980
Karlheinz Hillermeier (Enka AG), Herbert Blumberg (Enka AG), Albrecht Hille, and Georg Menges Bonn Bundesministerium fuer Forschung und Technologie Jul. 1983 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-155; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

Light weight molding compounds reinforced with polyester fibers are described. A special cutting system was developed for preparation of the sheet molding compounds (SMC). Organic fiber reinforced SMC was produced in a similar way to glass reinforced SMC. Polyester fibers suffer hardly any damage during injection molding and their properties do not deteriorate. The mechanical properties are poorer than those of glass reinforced SMC, while impact strength is higher. The breaking patterns show less sharp edges. The surface is smoother and shinier. The higher shrinkage of polyester fiber reinforced molding compounds necessitates the use of special molds. Author (ESA)

N84-14343# Max-Planck-Institut fuer Metallforschung, Stuttgart (West Germany). Pulvermetallurgisches Lab.
OPTIMIZATION OF SIC-BASED MATERIALS Final Report, Sep. 1979
Josef Lorenz Bonn Bundesministerium fuer Forschung und Technologie Jul. 1983 89 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-161; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

Dispersions of ZrO2 and HfO2 in silicon carbide (SiC) matrices were used in order to achieve a better toughness of the material due to the martensitic transformation toughening mechanism. Samples were prepared by hot pressing powder mixtures. The ZrO2 and HfO2 dispersions were chemically stabilized in the matrix by the additives SiO2 and A12O3. The influence of the additives on thermal expansion coefficient and oxidation resistance of the material was studied. Results show that SiC with 5.5 vol/% HfO2 possesses the best fracture toughness combined with the best oxidation resistance. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-14344# Materials Research Labs., Melbourne (Australia).
MERCURIC 5-NITROTETRAZOLE, A POSSIBLE REPLACEMENT FOR LEAD AZIDE IN AUSTRALIAN ORDNANCE. PART 1: AN ASSESSMENT OF PREPARATION METHODS
L. D. Redman and R. J. Spear Aug. 1983 28 p refs
(MRL-R-901; AR-003-794) Avail: NTIS HC A03/MF A01

The preparation of mercuric 5-nitrotetrazole (MNT) via both Cuen2(NT)2 and NaNT.2H2O was investigated. The former route is superior as judged by reproducibility, handleability and yield of MNT, and safety of intermediates - one batch of NaNT.2H2O exploded spontaneously, casting doubts on its stability. Sensitivity data together with limited data for stab sensitivity, initiation and detonation properties are given for each batch of MNT. MNT has definite promise as a replacement for lead azide in detonators. Author

N84-14345# Michigan Univ., Ann Arbor. Gas Dynamics Labs.
SHOCK TUBE STUDY OF THE IGNITION AND COMBUSTION OF ALUMINUM Final Report, 11 Jun. 1979 - 10 Mar. 1982
J. F. Driscoll, J. A. Nicholls, V. Patel, B. Khatib-Shahidi, and T. C. Liu Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Aug. 1983 72 p
(Contract F04611-79-C-0030; AF Proj. 2308)
(AD-A134035; UM-017385-F; AFRPL-TR-83-053) Avail: NTIS HC A04/MF A01 CSCL 21/9

The goal of this project is to obtain data that will help identify the reaction mechanism and the ignition limits of aluminum at elevated temperatures and pressures. Formidable problems arise when attempting such measurements in rocket motors since conditions are unsteady and not easy to control. Therefore, it was decided to mount a pure aluminum sample to the end wall of a shock tube and to ignite the sample using a reflected shock wave. The pressures and temperatures that can be achieved (40 atm, 5000 K) are typical of rocket motor conditions and are much higher than those obtained in previous studies using incident shock waves in conventional shock tubes. The aluminum sample reacts with a test gas in which the proportions of nitrogen, hydrogen, oxygen and chlorine are the same as found in ammonium perchlorate. GRA

N84-14346# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A 2-DIMENSIONAL NUMERICAL STUDY OF DETONATION PROPAGATION BETWEEN MUNITIONS BY MEANS OF SHOCK INITIATION Final Report
John Starkenberg, Yun K. Huang, and Alvin L. Arbuckle Sep. 1983 35 p Original contains color illustrations
(DA Proj. 1L1-61102-AH-43)
(AD-A133680; AD-F300324; ARBRL-TR-02522) Avail: NTIS HC A03/MF A01 CSCL 19/4

Computations of the flow field resulting when a munition is detonated adjacent to an identical neighbor have been made using the two-dimensional, eulerian, reactive hydrodynamic computer code, 2DE. The code was used to predict the effects of donor initiation site, interrround separation distance, and shielding. The results indicate that a very complicated flow field is produced; that far-side initiation of the donor represents a worst case; that, for rounds separated only by an air space, the shock initiation hazard is maximum at an intermediate interround separation; that even very thin plastic shields which fill the space between the rounds are remarkably effective in reducing the shock initiation hazard; and that when the explosive sensitivity is sufficiently reduced the acceptor is no longer initiated by buildup of the principal shock. The potential usefulness of 2DE in predicting shock initiation has been evaluated. GRA

N84-14347# SRI International Corp., Menlo Park, Calif.
LAGRANGE GAGE STUDIES OF NONIDEAL EXPLOSIVES CONTAINING NH-4NO-3 Final Report
M. Cowperthwaite and J. T. Rosenberg Jun. 1983 68 p
(Contract DAAG29-80-C-0076)
(AD-A132760; ARO-16856.1-CH) Avail: NTIS HC A04/MF A01 CSCL 19/1

Theoretical and experimental studies of planar detonation waves in Amatex 20 were performed to obtain a better understanding of the role of ammonium nitrate in the detonation process in explosives formulated from RDX, TNT, and AN. The theoretical work was performed to provide a more definitive and realistic treatment of steady-state detonation waves in such composite explosives. The treatment developed for such waves extends the classical Zelodovich-von Neumann-Doering (ZND) model for ideal detonation into a prototype model for nonideal detonation. The kinetic processes responsible for nonideal behavior were assumed to be incomplete decomposition of the slowest reacting explosive component, and the incomplete attainment of chemical equilibrium among the detonation products from the different explosive components. The experimental work was performed to obtain a more complete characterization of the detonation process in Amatex 20. The mean particle size of AN in the Amatex 20 charges was increased from the baseline value of approx. 7 mm to a value of approx. 2 mm. Multiple Lagrange particle velocity gage experiments were performed and analyzed to obtain a quantitative description of planar detonation in this coarse-grained Amatex 20. GRA

N84-14348# Weapons Systems Research Lab., Adelaide (Australia).
COLOUR TESTING OF NITROCELLULOSE PROPELLANTS BY A SPECTROPHOTOMETRIC METHOD
R. M. Kempson Jan. 1983 24 p
(AD-A133091; WSRL-0303-TM) Avail: NTIS HC A02/MF A01 CSCL 19/1

The colour test is a test for chemical stability that can be applied to many of the nitrocellulose propellants stabilized with ethyl centralite. A spectrophotometric method has been developed for carrying out this test and for the preparation and checking of the associated standard colour solutions. Good agreement has been obtained with the method relying on visual comparisons. However, as visual comparisons of colour intensity are operator dependent and are more difficult at high intensities the spectrophotometric method is considered to be superior. The satisfactory matching of results with those of Materials Research Laboratories for identical propellant samples has established consistency of colour number determinations following transfer of gun propellant surveillance work to Weapons Systems Research Laboratory.GRA

N84-14349# Los Alamos Scientific Lab., N. Mex.
MEASURED HUGONIOT STATES OF A 2-ELEMENT FLUID, O-2 + N SUB 2 PRIME, NEAR 2 Mg/m-3
Garry L. Schott 1983 5 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18-21 Jul. 1983
(Contract W-7405-eng-36)
(DE83-015910; LA-UR-83-2172; CONF-830719-13) Avail: NTIS HC A02/MF A01

Measured single shock Hugoniot quantities are reported for a 1:1 atomic mixture of the elements oxygen and nitrogen in each of two liquid initial states. One of these is the inert equimolar solution O2 + N2, at T approx. = 85K, v approx. = 1.06 cu m/Mg; the other is the pure explosive compound nitric oxide, NO, at T approx. = 122K, v approx. = 0.79 cu m/Mg. First shock pressures are in the range 10 to 30 GPa. The two Hugoniots have common values of specific volumes and energies near 20 GPa; that is, they intersect. This permits a novel test of attainment of steady waves with equilibrium composition, such that a single equation of state may describe the shocked reactive fluid. DOE

N84-14350# Los Alamos Scientific Lab., N. Mex.
ALTERNATIVE GASEOUS-FUELS SAFETY ASSESSMENT
M. C. Krupka, A. T. Peaslee, Jr., and H. L. Laquer 1983 12 p refs Presented at the 6th Miami Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 12-14 Dec. 1983
(Contract W-7405-eng-36)
(DE84-001735; LA-UR-83-3028; CONF-831205-2) Avail: NTIS HC A02/MF A01

A relative safety assessment of alternative gaseous and reference liquid fuels utilized for light automotive transportation in the public sector was completed. The specific fuels considered were compressed natural gas, liquefied natural gas, liquefied petroleum gas, and the liquid fuels, gasoline and diesel. The assessment methodology describes and develops the relative hazards of these fuels from an integrated generic physiochemical property and accident scenario point of view. A technique involving a method of eliciting expert judgment combined with a comparative scoring methodology was applied in establishing fuel relative safety rankings. Limitations of this type of assessment are discussed. Selected accident scenarios included fuel leakage in both residential and public garages; fueling line rupture at a refueling station in the presence of user vehicles or delivery vehicles; and vehicle collisions under rural, urban, and vehicular tunnel conditions. Overall, the results obtained demonstrate dependency upon the specific application of scenario. Gaseous fuels have increased relative risks in certain situations and are relatively safe in others. The results suggest that alternative gaseous fuels are not disqualified for public usage. The assessment also provides rationale for the development of selected safe handling criteria and recommendations. DOE

N84-14351 Georgia Inst. of Tech., Atlanta.
BEHAVIOR OF ALUMINUM ON THE BURNING SURFACE OF A SOLID PROPELLANT Ph.D. Thesis
Jayaraman Kalambur Sambamurthi 1983 197 p
Avail: Univ. Microfilms Order No. DA8315360

Aluminum powder when used as an ingredient in solid propellants goes through a complex sequence of retention, accumulation, agglomeration, ignition and detachment processes in passing through the combustion zone. It is difficult to set up a reasonable quantitative theory encompassing all these complexities of a three dimensionally chaotic propellant burning surface. So in this investigation a realistic qualitative theory is postulated for the behavior of aluminum particles on the burning surface and for the different mechanistic processes governing the behavior. Particular attention is given to AP-hydrocarbon propellants. The validity of the postulated theory is examined by conducting an experimental investigation. The results of the experimental investigation and the postulated qualitative theory are utilized to construct a sequence of mechanistic scenario for the behavior of aluminum in propellant combustion. Dissert. Abstr.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-14352*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH SPEED MACHINING OF SPACE SHUTTLE EXTERNAL TANK LIQUID HYDROGEN BARREL PANEL
James D. Hankins Nov. 1983 44 p refs
(NASA-TM-82557; NAS 1.15:82557) Avail: NTIS HC A03/MF A01 CSCL 13H

Actual and projected optimum High Speed Machining data for producing shuttle external tank liquid hydrogen barrel panels of aluminum alloy 2219-T87 are reported. The data included various machining parameters; e.g., spindle speeds, cutting speed, table feed, chip load, metal removal rate, horsepower, cutting efficiency, cutter wear (lack of) and chip removal methods. Author

N84-14353# Materials Research Labs., Melbourne (Australia).
PERMEABILITY OF FLEXIBLE MATERIALS USED IN FUEL STORAGE TANKS. PART 1: GENERAL REVIEW
B. C. Ennis Aug. 1983 28 p refs
(MRL-TN-459; AR-002-746) Avail: NTIS HC A03/MF A01

The transport of hydrocarbon fuels through composite elastomer-coated fabrics was studied in order to identify critical factors that affect the design of the fabrics and the selection of materials. Specific areas of interest are nominated. S.L.

N84-14354# CTI-Cryogenics, Inc., Waltham, Mass.
CLOSED CYCLE CRYOCOOLER FOR LOW TEMPERATURE ELECTRONICS CIRCUITS: COLD END TEST Final Report, 9 Apr. - 31 Dec. 1982

F. William Pirtle Aug. 1983 27 p
(Contract N00014-82-C-0326)
(AD-A134043) Avail: NTIS HC A03/MF A01 CSCL 13/1

A fabricated MACOR cold end including a metallic coating to prevent helium permeation and a fabricated die post displacer support bearing were combined with a compressor and motor which are standard CTI-CRYOGENICS products. A mechanical test was performed on the test cryocooler to determine that the mechanical test was performed on the test cryocooler to determine that the MACOR displacer was successfully guided by the die post bearing. Thermodynamic tests were conducted to determine the lowest temperature of the 4th (coldest) stage as a function of operating speed, helium charge pressure, 4th stage electrical heat load, and transfer tube diameter. Cooldown and steady state results are reported. Results indicate a low temperature limit of approximately 95K with the current test hardware. Although this represents an improvement from 122K during the program, a resizing will be necessary to reach 10K. The die post displacer support bearing and the MACOR cold finger construction are mechanically satisfactory. GRA

N84-14355# Bell Aerospace Corp., Wheatfield, N. Y.
LACV-30 INCREASED PAYLOAD STUDY Report, for Sep. 1982 - Apr. 1983
Aug. 1983 141 p
(Contract DAAK70-82-C-0196)
(AD-A133804; Rept-7467-928028) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report summarizes the results of a six-month study directed at investigating a number of potential improvements to the U.S. Army's LACV-30. The objective of this program has been to examine and evaluate various ways of increasing the LACV-30's payload, without incurring a large increase in cost, or penalizing its performance, either over land or over water, in varying sea state conditions. The work performed identified several potential improvements which could be beneficial to the LACV-30, giving it greater load-carrying capacity. These include: (1) A reduction in the exit area of the stern seal cones; (2) Reversal of the direction of rotation of the LACV-30's port side lift fan, with a corresponding adjustment of the volutes to direct the flow of the air from the fan to the stern and side bags; and (3) Replacement of the LACV-30 lift fans, with new fans designed to operate at pressures and flow rates better matched with the seal system requirements. GRA

N84-14356# Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
CHEMICAL STABILIZATION OF SUBGRADE SOIL FOR THE STRATEGIC EXPEDITIONARY LANDING FIELD M.S. Thesis
Michael H. Conaway Jun. 1983 101 p
(Contract N66314-70-A-0067)
(AD-A132876) Avail: NTIS HC A06/MF A01 CSCL 01/5

The Strategic Expeditionary Landing Field (SELF) is a military expeditionary-type airfield with an aluminum matted surface that is designed for sustained tactical and cargo airlift operations in an amphibious objective area. Because of the operational traffic parameters such as loads of the various types of aircraft, tire pressures and volume of traffic, a base layer must be constructed over subgrade soil support conditions which may be only marginal. The base layer could be constructed with conventional soil construction techniques (compaction) and yield the required strength. It would be difficult, however, to maintain this strength for the required one-year service life under many climatic conditions due to the degrading effects of water on the support capacity of many soils. Chemical soil stabilization with lime, portland cement and asphalt stabilizing agents could be used to treat the soil. These additives, when properly mixed with certain types of soils, initiate reactions which will increase soil support strength and enhance durability (resistance to the degrading effects of water). Technically, this procedure is quite viable but logistically, it may not be feasible. GRA

N84-14357# Army Construction Engineering Research Lab., Champaign, Ill.
ELECTROMAGNETIC SHIELDING OF FULL-SIZED STRUCTURES BY METAL ARC SPRAYING Final Technical Report
Paul Nielsen Aug. 1983 21 p
(DA Proj. 4AT-62719-AT-40)
(AD-A132883; CERL-TR-M-332) Avail: NTIS HC A02/MF A01 CSCL 18/6

This report describes a study to determine the feasibility of arc spraying metal onto a room-sized structure to provide economical electromagnetic shielding. The study concluded that shielding can be significantly upgraded by arc spraying over the seams of existing modular shielded construction. Structural shielding can also be supplied by arc spraying metal onto standard construction materials. Author (GRA)

N84-14358# Georgia Inst. of Tech., Atlanta.
THE USE OF CYCLONE MODELING IN THE ERECTION OF PRECAST SEGMENTAL AERIAL CONSTRUCTION M.S. Thesis
Scott Cleveland Jun. 1983 97 p
(Contract N66314-70-A-0067)
(AD-A132885) Avail: NTIS HC A05/MF A01 CSCL 13/13

The intent of this work is to analyze two methods of obtaining activity duration data in the field for use in the CYCLONE modeling program for determining construction productivity. One method is the traditional stopwatch-type study while the other is utilization of time-lapse photography. The construction activity which will be observed is the erection of an aerial guideway for the Metropolitan Atlanta Rapid Transit Authority (MARTA) rail line. The aerial guideway is being built using precast post-tensioned segmental concrete construction. This method of bridge construction or elevated span construction has proven to be more economical than more conventional methods of construction. One of the primary reasons for lower cost is the speed at which precast post-tensioned segmental concrete construction can be put in place. Field data for the erection procedure will be input into the CYCLONE model to obtain a production rate to be compared to actual field production. Author (GRA)

N84-14359# State Univ. of New York, Stony Brook.
TENTH INTERNATIONAL THERMAL SPRAYING CONFERENCE
Herbert Herman 16 Aug. 1983 18 p Conf. held in Essen, 2-6 May 1983
(AD-A133074; ONRL-C-14-83) Avail: NTIS HC A02/MF A01 CSCL 13/8

In thermal spraying, protective coatings are formed through high velocity melt-spray deposition of a wide range of materials (plastics, metals, ceramics) onto substrates to be protected. The high temperatures for melting are achieved through combustion, with an electric-arc, or within a plasma. The conference examined the scientific bases of the processes as well as a number of active applications, including corrosion/oxidation and wear and erosion resistant coatings, gas turbine engines, and a number of high temperature applications. GRA

N84-14360# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
DIRECT DETERMINATION OF SURFACE STRUCTURES FROM PHOTOELECTRON DIFFRACTION
J. J. Barton, C. C. Bahr, Z. Hussain, S. W. Robey, L. E. Klebanoff, and D. A. Shirley Sep. 1983 42 p refs Presented at the Am. Vacuum Soc. Meeting, Boston, 1-4 Nov. 1983 Sponsored in part by NSF
(Contract DE-AC03-76SF-00098)
(DE84-002572; LBL-16314; CONF-831171-10) Avail: NTIS HC A03/MF A01

Photoelectron diffraction data to give surface structure information were analyzed. Photoelectron diffraction causes the intensity of photoemission peaks to vary with electron energy or exit angle. Recent work with particular emphasis on the variety of information one can derive from energy dependent photoelectron diffraction measurements is summarized. DOE

N84-14361# Varigas Research, Inc., Timonium, Md.
EFFICIENCY OF COMPRESSED-AIR SYSTEMS Final Report

1983 30 p refs
(Contract DE-AC03-81CS-40520)
(DE84-002599; DOE/CS-40520/T1) Avail: NTIS HC A03/MF A01

The current state of knowledge in American industry concerning the energy efficient design and operation of industrial compressed air systems and system components is examined. Since there is no standard reference for designers and operators of compressed air systems which provides guidelines for maximizing the energy efficiency of these systems, a major product of this contract was the preparation of a guidebook for this purpose. DOE

N84-14362# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
ADVANCES IN COMPUTER-AIDED PROCESS PLANNING
Tien-Chien Chang Jul. 1983 139 p refs
(Grant NBS-DA-3010)
(PB83-252254; NBS-GCR-83-441) Avail: NTIS HC A07/MF A01 CSCL 13H

Current state-of-the-art process planning systems are reviewed. Approaches used in current systems are also discussed. A modular system structure is proposed for an automated manufacturing research facility. The structure is capable of accommodating all the necessary planning functions. The technical difficulties of implementing such a proposed process planning system are discussed. GRA

N84-14363# Texas A&M Univ., College Station.
EVALUATION OF FABRIC INTERLAYERS Report, Sep. 1978 - Nov. 1982
Joe W. Button and Jon A. Epps Nov. 1982 108 p refs Sponsored in part by Texas State Dept. of Highways and Public Transportation
(PB83-253245; TTI-2-9-779-261-2; FHWA/TX-83/6-261-2) Avail: NTIS HC A06/MF A01 CSCL 13B

Fabric underseals were placed in asphalt concrete overlay systems in four different regions of Texas in 1979 and 1980. The overlaid pavements included asphalt concrete, portland cement concrete and a freshly cold-milled asphalt concrete. Relative reflection cracking was evaluated annually on these test sections for up to three years. Laboratory tests on the construction materials were performed. At this time, there is no substantial evidence from which one could conclude that one fabric offers an advantage over another fabric or that fabric, in general, is better than none at all. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-14364 Northwestern Univ., Evanston, Ill.
MATHEMATICAL ANALYSIS OF DIGITAL PHASE LOCKED LOOPS OVER FADING COMMUNICATION CHANNELS Ph.D. Thesis
Quoc Tuyen Lac 1983 141 p
Avail: Univ. Microfilms Order No. DA8315948

An analysis of digital phase locked loops over various fading communication channels, with emphasis on Rician, Rayleigh and Lognormal channels, is presented. Both the moment method and the finite element formulation is conjunction with the Petro-Galerkin method are used for solving the steady state Chapman-Kolmogorov integral equation. The performance of digital phase locked loops is determined following the proposed methods. Loop performance is characterized in terms of variance of the reduced phase error process. Some lemmas and theorems relating to the simplification of the computing process are developed. Convergence problems of the finite element method are discussed. From the computer results, comparisons are made between the moment method and the finite element method in terms of computation time. Finally, the validity of the finite element method is discussed from certain points of view. Dissert. Abstr.

N84-14365# Polytechnic Inst. of New York, Brooklyn.
DIGITAL COMMUNICATIONS OVER SATELLITE CHANNELS Ph.D. Thesis
Aly Fahim Elrefaie 1983 157 p
Avail: Univ. Microfilms Order No. DA8316759

The problem of digital data transmission over bandlimited nonlinear channels in the presence of intersymbol interference, white Gaussian noise in the uplink and downlink paths, is considered. The satellite transponder is assumed to be either of the hard-limiter or soft-limiter type. A maximum likelihood receiver is developed to detect B phase shift keying signals transmitted over a satellite channel. It is shown that for wideband channels, the receiver structure corresponds to the one-sample test for both hardlimiting and softlimiting transponders. As part of the derivation of optimum receivers, a square law structure is obtained for the softlimiter case with intersymbol interference. The analysis is then repeated for the Q phase shift keying system with similar results. Also, the problem of in-bank carrier interference in the presence of uplink and downlink noise is considered by deriving the likelihood receiver for this case. It is shown that the optimum receiver is of the one-sample type for the wide band channel and of the square law type for the band limited case. Dissert. Abstr.

N84-14366 Michigan State Univ., East Lansing.
TRANSIENT WAVEFORM SYNTHESIS FOR RADAR TARGET DISCRIMINATION Ph.D. Thesis
Che-I Chuang 1983 251 p
Avail: Univ. Microfilms Order No. DA8315442

A new scheme for radar detection and discrimination, the transient waveform synthesis method, is investigated. This scheme consists of synthesizing an aspect-independent waveform for the incident radar signal which excites the target in such a way that the return radar signal from the target contains only a single resonance mode of that target in the late-time period. When the incident waveform synthesized to excite a particular natural mode of a known preselected target is applied to a different target, the return signal will be significantly different from that of the expected natural mode. The wrong target can thus be discriminated. Three kinds of targets, a normally oriented infinite cylinder, a pair of skew-coupled wires and a system of crossed wires are investigated. Both integral-equation and differential-equation approaches are used to search for the natural resonance modes of the targets. Impulse responses are then computed using these natural modes and the singularity expansion method (SEM). Dissert. Abstr.

N84-14367 Polytechnic Inst. of New York, Brooklyn.
SOME ROBUST TECHNIQUES IN RADAR SIGNAL PROCESSING Ph.D. Thesis
Chen-yi Chang 1983 215 p
Avail: Univ. Microfilms Order No. DA8316754

An easily implementable real time robust detection system was developed. The resulting detectors adapt to slow-varying and are robust in the presence of fast-varying noise statistics. The theory of robustrized m-interval statistic introduced by Tsai and Kurz is extended to the circularly symmetrical (CS) nongaussian noise detection problems. Envelope domain approach is shown to be simple and effective. The existence, dynamics and implementation of discrete weak signal robust detection systems are presented. Two implementation techniques based on m-interval piecewise linear detector (MILD) are shown to have efficacies approaching that of the locally optimum detector (LOD) even under varying noise conditions. The theory of MILD is extended to include the narrowband nongaussian noise detection problem. The discussion considers the problem of correlation between the inphase and the quadrature noise components. A high detection probability and a constant false alarm rate modified rank test which combines the best qualities of rank and partition detectors is presented. The detector remains efficient and robust even for reference sample size of one hundred and is, therefore, a promising class of detectors even for rapidly varying noise environments. Dissert. Abstr.

N84-14368 Iowa State Univ. of Science and Technology, Ames.
AN EVALUATION OF THE BROADBAND DIRECTION FINDING CAPABILITIES OF ARRAY SIGNAL PROCESSING TECHNIQUES Ph.D. Thesis
Larry Donald Bacon 1983 149 p
Avail: Univ. Microfilms Order No. DA8316138

The objective of this study was to determine and compare the direction winding capabilities of high resolution spectral analysis techniques applied to the signals from an antenna array. The maintenance of acceptable resolution over a broad operating frequency range was of particular concern. The comparison was accomplished by computer simulation of the performance of a linear array of eleven isotropic elements, spaced 15 cm apart, over the frequency range from 100 MHz to 1.0 GHz. The two-signal resolution of three linear prediction based algorithms was compared. The variation in performance with signal-to-noise ratio, frequency, and center angle of arrival was also evaluated. An algorithm due to Tufts and Kumaresan which reduces the effects of noise by replacing the noisy signal correlation matrix by a smoothed, least-squares fit to it gave the best performance at the cost of the highest computational complexity. Dissert. Abstr.

N84-14369 Polytechnic Inst. of New York, Brooklyn.
AN ANALYSIS OF NOISE AND INTERFERENCE IN A SATELLITE BASED MOBILE COMMUNICATIONS SYSTEM Ph.D. Thesis
Shalom Solomon Bergstein 1983 168 p
Avail: Univ. Microfilms Order No. DA8316750

In any satellite-to-mobile or mobile-to-mobile communications system, the effects of fading, propagation path loss, noise, interference, and non-linearities on the signal have to be considered. The basic problem is to evaluate the performance of such a communications link for various signaling schemes. However, the multitude of the noise, attenuation and interference effects described above would introduce so many variables that a mathematical solution would be too complex to lend itself to a meaningful analysis. One feasible approach is to model separately all the complex phenomena present in the mobile communications system (as separate components of a linear system) and analyze and/or simulate them individually on a computer. Accurate performance tests of the overall system could then be readily obtained since each component of the system would be modeled and proved correct independently (with no approximations made) of the other. Dissert. Abstr.

N84-14370 Illinois Univ., Chicago.
GENERATION OF COHERENT, VACUUM ULTRAVIOLET AND EXTREME ULTRAVIOLET RADIATION Ph.D. Thesis
Triveni Srinivasan 1983 177 p
Avail: Univ. Microfilms Order No. DA8312257

The research work involved in this thesis can be broadly divided into three phases. The first phase is the generation of transform limited radiation at 193 nm with a pulse duration of either 10 ns or 10 ps. The method adopted to obtain this radiation is as follows: the output of either a single frequency continuous wave, 10 ns pulsed or 10 ps pulsed dye laser (lambda = 581 nm) is first amplified in a dye amplifier chain pumped by a XeCl* laser and then frequency tripled in a heat pipe containing strontium as the nonlinear medium and xenon as the phase matching gas. The 193 nm radiation thus obtained is finally amplified in a series of ArF* amplifiers. Phase 2 consists of upconverting the frequency of the ArF* radiation via harmonic generation and sum frequency mixing. In the third phase, the 10 ps radiation has been used as the pump source for two photon emission excitation of H2. Following this excitation, simulated emission at a number of discrete frequencies in the infrared and vacuum ultraviolet has been observed. The VUV radiation corresponds to Werner and Lyman bands, the shortest wavelength observed being 117.6 nm. Dissert. Abstr.

N84-14371 California Univ., Irvine.
HIGH POWER, VERY BROADBAND MICROWAVE RADIATION FROM THE INTERACTION OF A RELATIVISTIC ELECTRON BEAM WITH PLASMAS IN THE LOW MAGNETIC FIELD REGIME, WITH APPLICATION TO THE TYPE 3 SOLAR BURST PHENOMENON Ph.D. Thesis
Keith Gene Kato 1983 242 p
Avail: Univ. Microfilms Order No. DA8313795

Prodigious quantities of microwave energy are observed uniformly across a very wide frequency band when a relativistic electron beam penetrates a plasma. Typically we measure 20 MW total in the calibrated range and estimate as high as 350 MW total in our full observational range for delta f is equal to or approximately 100 GHz. An intense annular, pulsed REB is fired through an unmagnetized or weakly magnetized plasma column. A model of Compton like boosting by the beam electrons of ambient plasma waves, with the collateral emission of high frequency photons, qualitatively explains our observed spectra. A transition in spectral behavior is observed from the weak to strong turbulence theories advocated for Type 3 solar burst radiation, and further into a regime characterized as superstrong REB plasma interactions. Dissert. Abstr.

N84-14372# British Broadcasting Corp., London (England).
OPTICAL FIBRE LINKS FOR DIGITAL YUV SIGNALS
R. P. Marsden Nov. 1983 8 p refs
(BBC-RD-1983/14) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A recent CCIR recommendation established a digital coding standard for separate component video signals in television signals. The basic serial bit rate for the video signal is 216 Mbit/s. Prototype optical serial link equipment was built and tested with 1 km of optical fiber in the laboratory and an 800 m optical fiber cable installed between two studio centers. The equipment takes a component-coded video signal in parallel form, recodes it, and serializes it for transmission at a bit rate of 270 Mbits. The receiver performs the inverse process. The present limitations of optical switching technology, lack of standardization, cost and complexity of a complete electro-optic interface are the main obstacles to be overcome before this method of transmission can be widely accepted in studio centers. A.R.H.

N84-14373# British Broadcasting Corp., London (England).
AERIALS FOR USE IN TELEVISION OUTSIDE BROADCASTS
G. H. Millard, R. D. C. Thoday, and D. J. Darlington Oct. 1983 13 p refs
(BBC-RD-1983/12) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Several antennas developed for radio links in outside broadcasts with a portable or mobile television camera are described. The aerials are designed to operate in the upper part of the u.b.f. broadcast band or in the vicinity of 2.5 GHz. A.R.H.

N84-14374# British Broadcasting Corp., London (England).
DIGITAL AUDIO: DYNAMIC RANGE CONTROL OF DIGITAL AUDIO SIGNALS
G. W. McNally Nov. 1983 17 p refs
(BBC-RD-1983/17) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Digital methods for control of the dynamic range of digitally coded audio signals are described. Block diagram representations are given for both the realization of static and dynamic characteristics of a dynamic range controller. The methods for calculating coefficients representing the controlling parameters are derived and the effect of restricting the accuracy of the processing by the use of fixed wordlength arithmetic is examined. One form of distortion introduced because of this restricted accuracy processing can be described as 'zipper' noise and was successfully removed by adaptive smoothing of the gain control signal. The techniques were verified using a high speed audio signal processor, COPAS-2, thereby confirming that practical real time digital dynamic range control is feasible. Author

N84-14375# British Broadcasting Corp., London (England).
IONOSPHERIC PROPAGATION IN THE L. F. BROADCASTING BAND
P. Knight Nov. 1983 10 p refs
(BBC-RD-1983/15) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

Continuous field strength recordings made in the UK of l.f. transmissions from Poland and Algeria are described. The results show that sky waves propagate strongly during the day in winter, giving field strengths which are only about 15 dB less than night-time values. In winter, the transition from day to night is very gradual, with the signal strength increasing steadily for several hours. In summer, however, the daytime sky way is very weak and the transition between day and night is more rapid. Author

N84-14376*# Sonalysts, Inc., Waterford, Conn.
COMMUNICATIONS NETWORK DESIGN AND COSTING MODEL TECHNICAL MANUAL Final Report
K. P. Logan, S. S. Somes, and C. A. Clark 30 Sep. 1983 130 p refs
(Contract NAS3-23348)
(NASA-CR-168236; NAS 1.26:168236) Avail: NTIS HC A07/MF A01 CSCL 17B

This computer model provides the capability for analyzing long-haul trunking networks comprising a set of user-defined cities, traffic conditions, and tariff rates. Networks may consist of all terrestrial connectivity, all satellite connectivity, or a combination of terrestrial and satellite connectivity. Network solutions provide the least-cost routes between all cities, the least-cost network routing configuration, and terrestrial and satellite service cost totals. The CNDC model allows analyses involving three specific FCC-approved tariffs, which are uniquely structured and representative of most existing service connectivity and pricing philosophies. User-defined tariffs that can be variations of these three tariffs are accepted as input to the model and allow considerable flexibility in network problem specification. The resulting model extends the domain of network analysis from traditional fixed link cost (distance-sensitive) problems to more complex problems involving combinations of distance and traffic-sensitive tariffs. A.R.H.

N84-14377*# Sonalysts, Inc., Waterford, Conn.
COMMUNICATIONS NETWORK DESIGN AND COSTING MODEL PROGRAMMERS MANUAL Final Report
K. P. Logan, S. S. Somes, and C. A. Clark 30 Sep. 1983 403 p
(Contract NAS3-23348)
(NASA-CR-168237; NAS 1.26:168237) Avail: NTIS HC A18/MF A01 CSCL 17B

Otpimization algorithms and techniques used in the communications network design and costing model for least cost route and least cost network problems are examined from the programmer's point of view. All system program modules, the data structures within the model, and the files which make up the data base are described. A.R.H.

N84-14378*# Sonalysts, Inc., Waterford, Conn. Space Communications Div.
COMMUNICATIONS NETWORK DESIGN AND COSTING MODEL USERS MANUAL Final Report
K. P. Logan, S. S. Somes, and C. A. Clark 30 Sep. 1983 158 p
(Contract NAS3-23348)
(NASA-CR-168238; NAS 1.26:168238) Avail: NTIS HC A08/MF A01 CSCL 17B

The information and procedures needed to exercise the communications network design and costing model for performing network analysis are presented. Specific procedures are included for executing the model on the NASA Lewis Research Center IBM 3033 computer. The concepts, functions, and data bases relating to the model are described. Model parameters and their format specifications for running the model are detailed. A.R.H.

N84-14379# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SUBSYSTEM DUPLEXER FOR A 6-4 GHz EARTH STATION [SUBSISTEMA DUPLEXADOR PARA ESTACAO TERRENA EM 6/4 GHZ]
Eduardo Antonio Parada Tude and Werner Frueh Jul. 1983 19 p refs Presented at the 35th Ann. Meeting of the SBPC, Belem, Brazil, 6-13 Jul. 1983
(INPE-2795-PRE/357) Avail: NTIS HC A02/MF A01

The subsystem that separates the transmission and receives signals in the 6/4 GHz ground/station, is described. The subsystem is composed of the duplexer, transitions and filters. The design and test of these components are considered components are presented. VSWR little than 1.15, isolations better than 100 dB and insertion loss little than 0.2 dB are measured. Author

N84-14380# British Broadcasting Corp., London (England).
RADIO-FREQUENCY DETONATION HAZARDS: MULTIPLE-TRANSMISSION SAFETY ASSESSMENT OF A DETONATOR LOOP THAT MAY BE RESONANT
P. Knight Oct. 1983 8 p refs
(BBC-RD-1983/11) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

When a number of electro-explosive devices are connected in series to form a loop, currents induced by radio transmissions can cause premature detonation if they are strong enough. The hazard is increased if the loop is inadvertently tuned, but a resonance of this type cannot occur at more than one frequency at a time. Safety assessment procedure which may be used when several transmissions are present simultaneously is described. Author

N84-14381# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
BROADBAND ELECTROMAGNETIC INTERFERENCE TESTING FOR VEHICLES AND ELECTRICAL SUBSYSTEMS - NONCOMMUNICATIONS Final Report
12 Oct. 1983 22 p
(AD-A134087; TOP-2-2-613) Avail: NTIS HC A02/MF A01 CSCL 13/6

Provides procedures for measuring frequencies and amplitudes of electromagnetic emissions form vehicles and vehicular equipment including noncommunication electrical subsystems, to determine whether these emissions will interfere with the vehicle's electronic and electromechanical equipment. GRA

N84-14382# Air Force Geophysics Lab., Hanscom AFB, Mass.
A POLARIZATION DIVERSITY RADAR DATA PROCESSOR
James I. Metcalf and Graham M. Armstrong 28 Apr. 1983 29 p
(AF Proj. 6670)
(AD-A134011; AD-F300328; AFGL-TR-83-0111; AFGL-IP-318) Avail: NTIS HC A03/MF A01 CSCL 17/9

A real time data processor has been designed for use with the AFGL 10-cm Doppler weather radar which is to be operated with alternating transmission of horizontally and vertically polarized signals. In this mode of operation the reception of backscattered signals of polarizations identical to those of the transmitted signals allows the computation of the differential reflectivity between the two polarizations in addition to the absolute reflectivity and the Doppler mean velocity and variance. The switching of transmitted polarization introduces difficulties in the estimation of the autocovariance of the received signals, from which the Doppler velocity parameters are derived. The processor design and the allowed modes of radar operation circumvent these difficulties. This report describes the processing algorithms theoretically and presents details of the implementation of these algorithms in hardware. Author (GRA)

N84-14383# Romero (Antonio R.), North Highlands, Calif.
MAINTENANCE COMMUNICATIONS FOR THE 1990'S
Bascombe J. Dunlevy-Wilson and Antonio R. Romero Jul. 1983 57 p
(AD-A133978) Avail: NTIS HC A04/MF A01 CSCL 17/2

This study details weaknesses in the present maintenance communications system, especially radio and telephone voice circuits and data links. This study contends that the present system is a 'force divider' that is not combat reliable nor effective in peacetime. Paper criticizes type of equipment not in use, system design, maintenance concept, and present procurement policy. Proposes and Advanced Maintenance Communications System using MILSPEC tactical equipment (TRI-TAC), hardened computers, encrypted data links, backup command-control radio circuits, and survivable maintenance control centers. Author (GRA)

N84-14384# Florida Univ., Gainesville. Electronic Communications Lab.

BISTATIC RADAR CROSS SECTIONS OF CHAFF

Peyton Z. Peebles, Jr. Jun. 1983 40 p
(Contract DAAK21-82-C-0107; DA Proj. 1L6-62616-AH-77)
(AD-A133967; HDL-CR-83-107-6) Avail: NTIS HC A03/MF A01 CSCL 17/4

Bistatic cross sections applicable to scattering from a cloud of randomly positioned and randomly oriented resonant dipoles, or chaff, are found. The chaff cloud can have an arbitrary location relative to an illuminating radar and the radar antenna can have an arbitrarily specified polarization. The receiver can be located arbitrarily in relation to the radar and chaff cloud and can also have arbitrary polarization (different from transmitter antenna). Average cross sections are found a preferred receiver polarization, and the corresponding orthogonal polarization. Results are reduced to simple, easily applied expressions, and several examples are developed to illustrate the ease with which the general results can be applied in practice. Author (GRA)

N84-14385# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.

STUDY ON EXTREMIZING ADAPTIVE SYSTEMS AND APPLICATIONS TO SYNTHETIC APERTURE RADARS Annual Scientific Report, 10 Sep. 1982 - 9 Sep. 1983

Demetrios Politis May 1983 6 p
(Contract F49620-82-C-0097; AF Proj. 2312)
(AD-A133945; AFOSR-83-0852TR) Avail: NTIS HC A02/MF A01 CSCL 06/4

Klopf's work on the functioning of the neuron was studied and critically examined for engineering application possibilities. Similarly, Barto's work on the implementation of Klopf's ideas in computer simulated nets/systems was studied to determine if it could provide suitable models for physical systems. The latest learning system investigated by Barto, described as 'Learning with an Adaptive Critic' was considered as the most promising for engineering applications. A functional engineering model of that system has been developed and its dynamic behavior of this system is currently being investigated in order to improve our understanding of the system operation and potential applications. In parallel with this study we are looking for possible application of such learning systems in synthetic aperture radars and data exploitation. Several potential applications have already been suggested. These suggestions will be further explored and the most promising will be proposed for full investigation and possible implementation. GRA

N84-14386# Rensselaer Polytechnic Inst., Troy, N. Y. Center for Integrated Electronics.

FAULT TOLERANT SIGNAL PROCESSING USING FINITE FIELDS AND ERROR-CORRECTING CODES Final Report

G. R. Redinbo Jun. 1983 98 p
(Grant AF-AFOSR-0153-80; AF Proj. 2304)
(AD-A133927; AFOSR-83-0839TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

Finite field arithmetic may be efficiently applied for implementing signal processing architectures. The fundamental theoretical work in this area was done by Matluk and Gill. This report presents several new approaches for incorporating error-correcting codes with signal processing operations yielding fault tolerant systems. Fault tolerant levels can be distributed throughout the system's architecture. Such architectures will become necessary when very sophisticated and dense systems are implemented with Very Large Scale Integration. GRA

N84-14387# Army Electronics Research and Development Command, Fort Belvoir, Va. Night Vision and Electro-Optics Labs.

RANGE PERFORMANCE CALCULATIONS USING THE NVEOL-GEORGIA TECH RESEARCH INSTITUTE 0.1- TO 100-GHZ RADAR PERFORMANCE MODEL

Stanley P. Rodak and Nils I. Thomas May 1983 70 p
(AD-A133881; DELNV-TR-0035) Avail: NTIS HC A04/MF A01 CSCL 17/9

A computer model that can be used to calculate radar range performance at any frequency in the 0.1-to 100-GHz electromagnetic spectrum is described. These different numerical examples are used to demonstrate how to use the radar range performance model. Input/output documentation are included for each case that was run on the MERADCOM CDC 6600 computer at Fort Belvoir, Virginia. Author (GRA)

N84-14388# Naval Ocean Systems Center, San Diego, Calif.

ELF/VLF (EXTREMELY LOW FREQUENCY/VERY LOW FREQUENCY) LONG PATH PULSE PROGRAM FOR ANTENNAS OF ARBITRARY ELEVATION AND ORIENTATION Interim Report, Jan. - Aug. 1983

R. A. Pappert, L. R. Hitney, and J. A. Ferguson Aug. 1983 116 p
(AD-A133876; NOSC/TR-891) Avail: NTIS HC A06/MF A01 CSCL 20/14

A computer program designed to handle pulse propagation problems when the propagation channel is the earth-ionosphere waveguide, and intended for use in the ELF/VLF bands, is presented. The program is intended for use with laterally homogeneous channels. Allowance is made for transmit and receive antennas of arbitrary elevation and orientation. Mode data as a function of frequency from a waveguide program are required inputs to the present program. The mode data are interpolated by using cubic splines, and the requisite integrals are treated numerically by means of the fast Fourier transform. GRA

N84-14389# Rome Air Development Center, Hanscom AFB, Mass. Surveillance Technology Branch.

A SIMULATION ANALYSIS OF SPACE-BASED AND AIRBORNE MOVING PLATFORM RADARS IN LOOK-DOWN CLUTTER

Paul L. Repak May 1983 57 p
(AF Proj. 4506)
(AD-A133813; RADC-TR-83-126) Avail: NTIS HC A04/MF A01 CSCL 17/9

A simulation technique has been developed to provide the radar engineer with a tool for comparative examination of radar systems and target detection in the presence of look-down clutter. Using a plotting interface such as the Dedicated User Interface System (DUIS), an engineer can evaluate proposed radar designs against one another for target detection performance in a precise graphical format. The user is able to select an antenna function from either measured data or derived data under the existing Parametric Antenna Analysis Software (PAAS). The antenna platform may be at any designated altitude and velocity with respect to ground clutter scatterers. Entry of an exoatmospheric altitude automatically computes the proper circular satellite orbit velocity and introduces Earth rotation. Target radar echoes at specified ground locations are compared to clutter echoes in the sidelobes as well as the radar mainbeam. Analysis of output date serves as a measure of moving target minimum detectable velocity (MDV) for the total radar system. Written for analysts with some technical Doppler radar and clutter understanding this report leads the engineer through the theory and equations which develop the simulation computer program. Example cases and analyses are given to show program utility and output results. Author (GRA)

N84-14390# Air Force Systems Command, Wright-Patterson AFB, Ohio.

POSTS AND TELECOMMUNICATIONS

27 Sep. 1983 6 p Transl. into ENGLISH from Chinese Communist Affairs (China), v. 24, no. 1, 1981 p 115-116
(AD-A133805; FTD-ID(RS)T-0679-83) Avail: NTIS

HC A02/MF A01 CSCL 17/2

A telecommunication plant which can produce long and short distance carrier wave transmitting units, PCM digital transmitting units, optical cable communications equipment, transmission testers, and telegraph and computer terminals is presented. It can produce 9,000 transmitter terminals, 5000 voice channel systems, 2500 instruments, and 5 million various types of components annually. After expansion completion the production of PCM digital transmitting units will increase from 2000 to 4000 units, terminal transceiver units 5000 to 10000 units, and various components 20000 pieces. E.A.K.

N84-14391# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RELATIVITY AND RADARS
Laurence G. Taff 11 Jul. 1983 22 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A133791; TR-660; ESD-TR-83-033) Avail: NTIS
HC A02/MF A01 CSCL 17/9

This report discusses the special relativistic and general relativistic effects on electromagnetic propagation for artificial satellite applications. In particular the rigorous special relativistic Doppler shift between the received and transmitted frequencies is derived. The two radars need not be colocated and are assumed not to be in the same inertial reference frame. Numerical estimates of various approximations, second order series approximations, and lowest order post-Newtonian general relativistic terms are all performed. This work was spurred by the observational determination of the (v squared over c squared) term in Millstone Hill Radar observations of LAGEOS. Author (GRA)

N84-14392# Space and Missile Test Center, Patrick AFB, Fla.
PACIFIC BARRIER RADAR 3 (PACBAR 3) Final Report
C. D. Miller and J. D. Sigler 16 Sep. 1983 8 p
(AD-A133790; ESMC-TR-83-07) Avail: NTIS HC A02/MF A01 CSCL 17/9

PACBAR III will become a Space Division tracking (C-band radar) site in the Pacific, filling a gap in the worldwide tracking network. The C-band signature and metric radar system was removed from a tracking ship, the USNS General H. H. Arnold, prior to its deactivation in 1982. The C-band radar was a one-of-a-kind system designed by Sperry Gyroscope Co., Greatneck, N.Y. in the 1960's. Over the years the system was extensively modified by the Eastern Space and Missile Center (ESMC) to perform orbital and reentry tracking and recording of missile bodies. The data is collected on a primary target plus all secondary targets within the beam width and range cell. The Western Space and Missile Center (WSMC), Vandenberg Air Force Base, Calif is the Lead Range for PACBAR III. WSMC will construct the onsite facilities and ESMC will modify, refurbish, install, and check out the radar onsite. Author (GRA)

N84-14393# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A PROGRAMMABLE VOICE PROCESSOR FOR FIGHTER AIRCRAFT APPLICATIONS
Edward M. Hofstetter, Elliot Singer, and Joseph Tierney 18 Aug. 1983 44 p
(Contract F19628-80-C-0002; AF Proj. 2283; AF Proj. 411L)
(AD-A133780; TR-653; ESD-TR-83-037) Avail: NTIS
HC A03/MF A01 CSCL 17/2

A flexible, high-speed digital voice processor has been designed for use in conjunction with the JTIDS communication terminal to be installed for testing on board F-15 fighter aircraft and in Army JTIDS installations. The processor, known as the Advanced Linear Predictive Microprocessor (ALPCM), has an architecture which is similar to that of its predecessor but contains significant improvements in speed, memory, and software development aids. The design includes an arithmetic section (four AMD 2901C bit-slice RALUs and an AMD 29517 16x16 multiplier), a doubly pipelined control path, and an I/O section based on a finite state machine implementation. Microcode development is enhanced by the presence of an interactive debugging system consisting of a plug-in monitor board controlled from a host computer. The ALPCM is capable of implementing conventional 2400-bps LPC vocoders in real time and is sufficiently powerful to accommodate more sophisticated, computationally intensive algorithms should the extra performance they provide be required in the severe F-15 operational environment. Author (GRA)

N84-14394# General Research Corp., Santa Barbara, Calif.
RF SYSTEMS IN SPACE. VOLUME 2: SPACE-BASED RADAR ANALYSES Final Technical Report
A. V. Mrstik, D. Beste, R. J. Bartek, and P. M. Pazick Griffiss AFB, N.Y. RADC Apr. 1983 213 p
(Contract F30602-81-C-0119; AF Proj. 4506)
(AD-A133735; RADC-TR-83-91-Vol-2) Avail: NTIS
HC A10/MF A01 CSCL 17/9

The main objective of this effort was to develop a computer based analytical capability for simulating the RF performance of large space-based radar (SBR) systems. The model is capable of simulating corporate and space fed aperture. The model also can simulate multibeam feeds, cluster/point feeds, corporate feed and various aperture distributions. The simulation is capable of accepting Draper Labs structural data and antenna current data from Atlantic Research Corporation's (ARC) First Approximation Methods (FAM) and Higher Approximation Methods (HAM) models. In addition there is a routine to input various apertures surface distortions which causes the elements in the arrays to be displaced from the ideal location on a planar lattice. There were analyses looking at calibration/compensation techniques for large aperture space radars. Passive, space fed lens SBR designs were investigated. The survivability of an SBR system was analyzed. The design of ground based SBR validation experiments for large aperture SBR concepts were investigated. SBR designs were investigated for ground target detection. GRA

N84-14395# General Research Corp., Santa Barbara, Calif.
RF SYSTEMS IN SPACE. VOLUME 1: SPACE ANTENNAS FREQUENCY (SARF) SIMULATION Final Technical Report
A. C. Ludwig, J. R. Freeman, and J. D. Capp Griffiss AFB, N.Y. RADC Apr. 1983 253 p
(Contract F30602-81-C-0119; AF Proj. 4506)
(AD-A133734; RADC-TR-83-91-Vol-1) Avail: NTIS
HC A12/MF A01 CSCL 17/9

The main objective of this effort was to develop a computer based analytical capability for simulating the RF performance of large space-based radar (SBR) systems. The model is capable of simulating corporate and space fed aperture. The model also can simulate multibeam feeds, cluster/point feeds, corporate feed and various aperture distributions. The simulation is capable of accepting Draper Labs structural data and antenna current data from Atlantic Research Corporation's (ARC) First Approximation Methods (FAM) and Higher Approximation Methods (HAM) models. In addition there is a routine to input various apertures surface distortions which causes the elements in the array to be displaced from the ideal location on a planar lattice. These were analyses looking at calibration/compensation techniques for large aperture space radars. Passive, space fed lens SBR designs were investigated. The survivability of an SBR system was analyzed. The design of ground based SBR validation experiments for large aperture SBR concepts were investigated. SBR designs were investigated for ground target detection. GRA

N84-14396# Pennsylvania Univ., Philadelphia.
RESEARCH IN ADAPTIVE BEAMFORMING FOR SATELLITE COMMUNICATIONS Final Technical Report, 1 Nov. 1981 - 31 Oct. 1982
Fred Haber, Yeheskel Bar-Ness, Paul Chien-Chung Yeh, and Charles Bono May 1983 235 p
(Contract F30602-81-K-0211; AF Proj. 4519)
(AD-A133733; RADC-TR-83-54) Avail: NTIS HC A11/MF A01 CSCL 17/2

The results of an investigation of adaptive interference cancelling techniques for use with satellite borne arrays of sensors are presented in the report. 'A Hybrid Array' utilizing both a pointing vector and an internally generated reference is analyzed. The steady state and transient properties of the processor are presented showing speed of response, signal to interference plus noise ratio, and reduced sensitivity to pointing errors over schemes heretofore used. Also developed is the sensitivity to random amplitude and phase error in the pointing vector. A means by which the pointing vector can be obtained utilizing a pilot ground source is described and analyzed. In addition, analyses are presented on improved methods using only an internally generated reference. One scheme is analyzed in which non-oscillatory weights are obtained even when an imperfect reference is generated. This analysis is carried out assuming no interference, paralleling earlier work on a related scheme in which oscillatory weights were obtained. A second analysis is presented on a method which corrects the cause for unstable weights. This analysis is carried out with desired signal, interference, and noise present.

Author (GRA)

N84-14397# Joint Test Force, Kirtland AFB, N.Mex.
IFFN (IDENTIFICATION FRIEND, FOE, OR NEUTRAL) REPORT. PHASE 1: DESIGN ACTIVITIES
1983 14 p
(AD-A133702) Avail: NTIS HC A02/MF A01 CSCL 17/2

The Identification Friend, Foe, or Neutral Joint Test and Evaluation (IFFN JT&E) is directed by the Director, Defense Test and Evaluation, Office of the Under Secretary of Defense for Research and Engineering (OUSDRE/DDT&E). The purpose is to assess baseline US capabilities within the NATO Air Defense Command and Control System to perform the IFFN function; identify deficiencies in the performance of that function; and define near-term procedural and equipment modifications for future testing. The concept for testing is to replicate, through a computerized testbed, operational weapon and command and control system configurations in the 1985 - 1990 timeframe. The concept is centered on live operators using actual tactical hardware or simulators with realtime computer models to stimulate the equipment as well as provide stress, background loading, and added sources of identification inputs. To implement this concept, a geographically distributed testbed is to be established with a central facility that will control/direct the equipment. Actual testing is conducted in a series approach progressing through a vertical slice of an air defense system. Within each series, the test node or nodes will be examined under a matrix of conditions designed to stress different aspects of the identification problem.

Author (GRA)

N84-14398# Stanford Univ., Calif. Information Systems Lab.
RESEARCH ON ADAPTIVE ANTENNA TECHNIQUES 5 Final Report
Kenneth M. Duvall and Bernard Widrow Sep. 1983 144 p
(Contract N00019-82-C-0189)
(AD-A133676; AD-E401078) Avail: NTIS HC A07/MF A01 CSCL 17/4

Adaptive antennas provide an important means of enhancing signal-to-noise ratio in the adverse electromagnetic environments that sometimes arise due to jamming or interference. For that reason, adaptive antennas are increasingly finding application in high performance radar and communications systems. In many of these systems the adaptive subsystem must exhibit robust performance in the face of multipath or rapidly changing interference. Unfortunately, the adaptive beamformers now in use do not perform well in certain environments. It has been known for some time that correlated-signal conditions (e.g., due to multipath) can lead to partial or total cancellation of the desired signal within an adaptive beamformer. More recently it has been recognized that signal cancellation can arise during high-speed adaptation even though: (1) the desired signal and interfering signals are uncorrelated; and (2) the look-direction response is rigidly controlled. The initial sections of this report examine the signal cancellation mechanism, with emphasis on the more difficult uncorrelated-signal case. Simulation results are presented that illustrate the cancellation effect, and an analysis is given for a simple environment consisting of the desired signal and one jammer. GRA

N84-14399# Naval Ocean Systems Center, San Diego, Calif.
XWVG: A WAVEGUIDE PROGRAM FOR TRILINEAR TROPOSPHERIC DUCTS. COMPUTER PROGRAM FOR CALCULATING THE SIGNAL LEVELS OF EM (ELECTROMAGNETIC) WAVES PROPAGATING OVER SEAWATER
G. B. Baumgartner, Jr. 30 Jun. 1983 210 p
(RR02101)
(AD-A133667; NOSC/TD-610) Avail: NTIS HC A10/MF A01 CSCL 20/14

XWVG is a reliable waveguide program for calculating the coherent and incoherent mode sum values of the electromagnetic field strength in dB relative to the free space value, for signals propagating in a trilinear tropospheric duct over seawater. XWVG allows for the effects of surface roughness, absorption by atmospheric gases, and the variation of the complex index of refraction of seawater as a function of temperature, salinity, and frequency. XWVG has been successfully used in the frequency range 50 MHz to 94 GHz and should be usable at higher frequencies. XWVG uses the root-finding routine of Shellman and Morfitt to find the complex modes propagating in the duct. This guarantees that all modes with an attenuation rate below a prespecified level will be found. A description of XWVG is provided, along with a complete program listing and sample output.

Author (GRA)

N84-14400# Ohio State Univ., Columbus. Electroscience Lab.
ANALYSIS OF ELECTROMAGNETIC BACKSCATTER FROM AN INLET CAVITY CONFIGURATION Final Technical Report, 1 Apr. 1980 - 1 Apr. 1982
Prabhaker H. Pathak, Ching-Chao Huang, C. Y. Lai, and David L. Moffatt Griffiss AFB, N.Y. RADC Jan. 1983 298 p Sponsored in part by Rockwell Intern.
(Contract F19628-80-C-0056; AF Proj. 2305)
(AD-A133626; ESL-712661-4; RADC-TR-83-5) Avail: NTIS HC A13/MF A01 CSCL 12/1

The radar cross secction of jet engine configurations on modern aircraft is a most perverse problem analytically. An ability to predict the radar cross section of loaded cavity structures, even when such structures are only very crude models of the actual engine, has been seriously lacking. At the same time it is well known that above a certain spectral range the engine configuration largely controls the radar cross section of the aircraft over a large span of noise and often stern aspects. Recently, the radar signal modulation produced by the engines has become of important analytical concern. This report is separated into two parts. Part I, Ray Analysis of EM Backscatter from a Cavity Configuration contains the major thrust of our research and basically details an asymptotic frequency domain analysis of various loaded cavity structures. Part II, Canonical Response Waveforms of Finite and Open Circular Waveguides is essentially a time domain analysis of the same types of problems. The parts are interrelated in the sense that results from one are used in the other. For example, Part II reproduces a portion of the exact Wiener-Hopf computations for an open circular waveguide. These results were used to verify a portion of the theory in Part I. Conversely, frequency computations from the analysis in Part I are used in Part II as part of a Fourier synthesis procedure to obtain canonical response waveforms.

GRA

N84-14401# General Electric Co., Syracuse, N.Y. Advanced Development Engineering Sect.
A STUDY OF A CLASS OF DETECTION WAVEFORMS HAVING NEARLY IDEAL RANGE-DOPPLER AMBIGUITY PROPERTIES
John P. Costas Jul. 1983 41 p
(AD-A132597; R83EMH002) Avail: NTIS HC A03/MF A01 CSCL 17/9

A special class of permutation matrices is considered. It is shown that these matrices may be beneficially used to determine the frequency-time pattern of a uniform pulse train. Proper choice of burst waveform parameters is shown to result in a detection waveform having range and Doppler resolution properties consistent with the overall signal duration and bandwidth. The range-Doppler sidelobe peaks are well-controlled so that the ideal 'thumbtack' ambiguity function behavior is closely approximated by the synthesis procedure presented. Author (GRA)

N84-14402# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
SIMULATION AND INTERPRETATION OF POLARIZATION DIVERSITY RADAR SPECTRAL FUNCTIONS Interim Scientific Report
James I. Metcalf 28 Apr. 1983 52 p
(AF Proj. 6670)
(AD-A132622; AFGL-TR-83-0110; AFGL-ERP-835) Avail: NTIS HC A04/MF A01 CSCL 17/9

A numerical model was developed to simulate the power spectra, cross-spectrum, and derived functions obtainable from a coherent polarization diversity radar. The model was used to investigate the effects of air velocity variance, differential propagation, and noise on the spectral functions. Input parameters include radar wavelength, elevation angle, air velocity variance, rainfall rate, propagation distance, fraction of scatterers having a preferred orientation, and relative noise level. Results of calculations for 8.6 mm and 7.5 cm wavelengths are illustrated. These are compared with the functional forms obtained from theory and discussed in terms of the meteorological information derivable from them. The forms of the spectral power ratio and the cross-spectral amplitude ratio are strongly affected by air velocity variance and by noise. However, it appears possible to derive a good estimation of the Doppler air velocity from the power spectra. The cross-spectral amplitude ratio may be of more general value in analysis than previously thought, because its Doppler velocity domain is greater than that of the spectral power ratio in the presence of radar system noise. The absolute error of the propagation term estimated from the cross-spectral amplitude ratio is not strongly dependent on the rainfall rate or propagation distance. GRA

N84-14403# General Dynamics Corp., San Diego, Calif. Electronics Div.
ELECTROMAGNETIC WAVES NEAR DIELECTRIC STRUCTURES Final Report, Sep. 1981 - Jan. 1983
G. Tricoles, E. L. Rope, and R. A. Hayward Feb. 1983 7 p
(Contract N00019-81-C-0389)
(AD-A132630; R-83-047) Avail: NTIS HC A02/MF A01 CSCL 17/9

The influence of radome boresight error on missile guidance motivates the need for accurate methods of analyzing radomes. Although methods based on aperture diffraction and the approximation of local planeness are useful in some cases, these methods are inadequate for small radomes. This report describes a new method. It compares theoretical and experimental wavefront data. Author (GRA)

N84-14404# SRI International Corp., Menlo Park, Calif.
THE EFFECTS OF NATURALLY-OCCURRING PROPAGATION DISTURBANCES ON DISCRETE FOCUSED ARRAYS Final Report, Jan. - Dec. 1982
Charles L. Rino, Robert C. Livingston, Nancy B. Walker, and Michael D. Cousins Hanscom AFB, Mass. AFGL Mar. 1983 73 p
(AF Proj. 4643; SRI Proj. 4017)
(AD-A132645; AFGL-TR-83-0167) Avail: NTIS HC A04/MF A01 CSCL 17/9

The disruptive effects of ionospheric irregularities on space-based surveillance radars is considered. Propagation theory is used to first describe the parameters critical to such systems and to incorporate ionospheric parameters into that model. This is done using the equivalent phase screen approach with a statistical model of the in situ irregularity structure. The primary limitation that scintillation places on radar performance is the loss of spatial coherence, i.e., the resolving power of the radar. This, in turn, depends critically upon the turbulence strength, anisotropy, and motion of kilometer-scale irregularities. Although a complete spatial and temporal morphology of high-latitude structure is not yet known, data are available for near worst case performance estimates. Spaced receiver scintillation data directly provide all of the parameters critical to the performance analysis. Samples of such data from the auroral zone and central polar cap are presented; they show that radars with moderate-sized apertures may suffer degradation at some latitudes and local times. Author (GRA)

N84-14405# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS SATELLITE IMP (INTERFACE MESSAGE PROVISION) DEVELOPMENT MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, Jun. - 31 Aug. 1983
S. Blumenthal and D. McNeill Sep. 1983 27 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408)
(AD-A132690; BBN-5408; QTR-30) Avail: NTIS HC A03/MF A01 CSCL 17/2

Work on the development of Pluribus Satellite IMPs and on shipboard satellite communications is described. GRA

N84-14406# Mitre Corp., McLean, Va.
DEFENSE DATA NETWORK SUBSCRIBER INTERFACE GUIDE
Jul. 1983 73 p
(Contract F19628-82-C-0001)
(AD-A132877) Avail: NTIS HC A04/MF A01 CSCL 17/2

All currently operational and planned automatic data processing systems and data networks of the Department of Defense (DoD) that require long-haul and area data communications support are slated to become subscribers to the Defense Data Network (DDN) as required by the Office of the Secretary of Defense. The term subscriber refers not only to systems but also to those individuals with the managerial and technical responsibilities for the systems. Since the advent of the DDN, this group of action officers, managers, and systems analysts has been faced with the issue of how to connect their systems to the DDN. This Guide has been prepared to assist these decision-makers. The Guide explains the available alternatives for connecting systems to the DDN and the rationale for choosing among them. The selection options are based upon the communication requirements of the subscriber and the interfacing methods that will support these requirements. An appendix provides a detailed interface specification that could be included in subscriber interface acquisition packages. GRA

N84-14407# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
CAVITY DETECTION AND DELINEATION RESEARCH. REPORT 5: ELECTROMAGNETIC (RADAR) TECHNIQUES APPLIED TO CAVITY DETECTION
Robert F. Ballard, Jr. Jul. 1983 110 p
(AD-A132923; AD-F630031; WES/TR/GL-83-1; Rept-5) Avail: NTIS HC A06/MF A01 CSCL 17/9

This study evaluated four different radar systems to determine their effectiveness in locating subterranean cavities. Tests were conducted at three well-documented sites: Vicksburg, Miss.; Medford Cave, Fla. (near Ocala); and Manatee Springs, Fla. (near Chiefland). None of the radar systems was effective at the Vicksburg, Miss., site because of extremely high conductivities encountered in the overburden materials which were comprised primarily of silts (loess) and clays. The following radar systems were used in this study: (a) A pulsed system fabricated and operated by personnel from Texas A/M University; (b) A pulsed system commercially manufactured by GSSI operated by the owners, Technos, Inc.; (c) A pulsed system developed, fabricated, and operated by personnel from SwRI; and (d) A continuous wave system development, fabricated and operated by personnel from LLNL. GRA

N84-14408# Weissman (David E.), Northport, N.Y.
THE DEPENDENCE OF THE RADAR MODULATION TRANSFER FUNCTION ON ENVIRONMENTAL CONDITIONS AND WAVE PARAMETERS (A CONTRIBUTION TO STUDIES OF RADAR BACKSCATTERING FROM THE SEA SURFACE). REVISION Final Report, Jun. - Aug. 1983
David E. Weissman Aug. 1983 30 p Supersedes AD-A131, 858.0
(Contract N00014-83-M-0081)
(AD-A133064; DEW-83-1-REV) Avail: NTIS HC A03/MF A01 CSCL 08/3

This report shows how the Modulation Transfer Function, an important quantity for remote microwave sensing of ocean wave spectra, will vary with environmental conditions that control the air-sea interaction. The accuracy with which this quantity is known will determine the quality of remote measurements of ocean wave spectra. Microwave remote sensing of individual ocean wavelengths (and the complete directional spectrum) is based on synchronized reflectivity variations along each wave, that the radar can resolve spatially. This study demonstrates that the MTF, which is the ratio of this reflectivity (amplitude of variation) to the ocean wave amplitude, is affected by the air-sea interaction, in addition to the hydrodynamic interaction between capillary and long gravity waves. Recent measurements by the Naval Research Laboratory of the ocean wave-radar modulation transfer function (MTF) from fixed ocean platforms, over a period of several years, have demonstrated that the local hydrodynamic modulation of short centimeter waves is affected by the air-sea interaction. Results from widely separated ocean regions also show different individual properties, that make detailed measurements necessary. GRA

N84-14409# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.

DESIGN AND FABRICATION OF THE BNL RADIO FREQUENCY QUADRUPOLE

R. B. McKenzie-Wilson 1983 3 p Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21-23 Mar. 1983
(Contract DE-AC02-76CH-00016)
(DE84-001456; BNL-32768; CONF-830311-190) Avail: NTIS HC A02/MF A01

The polarized H(+) injection program for the AGS utilizes a radio frequency quadrupole for acceleration between the polarized source and the Alvarez linac. It is anticipated that future polarized H(+) sources will have a considerably improved output. The RFQ will operate at 201.25 MHz and will be capable of handing a beam current of 0.02 amperes with a duty cycle of 0.25%. The low average power allows novel solutions to the problems of vane alignment, RF current contacts, and removal of heat from the vanes. The cavity design philosophy is discussed together with the thermodynamics of heat removal from the vane. DOE

N84-14410# Wandel und Goltermann G.m.b.H. und Cie, Eningen unter Achalm (West Germany). Abteilung VIU.

COMMUNICATION TECHNIQUES: MEASURING TECHNIQUE PRINCIPLES AND APPLICATION EXAMPLES [NACHRICHTENUEBERTRAGUNGSTECHNIK: MESSTECHNISCHE GRUNDLAGEN UND ANWENDUNGSBEISPIELE]

1983 92 p In GERMAN
Avail: NTIS HC A05/MF A01

The state-of-the-art of communication measuring techniques is reviewed. Measuring techniques for voltage and level; analog data transmission; distortion; pulse code modulation; digital data signal transmission; and automatic measuring systems are discussed. Author (ESA)

N84-14411# Fondazione Ugo Bordoni, Rome (Italy).

DESCRIPTION OF THE PRELIMINARY MEASUREMENTS CARRIED OUT ON THE 11 GHz EXPERIMENTAL FACILITY AT ROMA-MONTE S. PANCRAZIO [DESCRIZIONE DELLE MISURE PRELIMINARI ESEGUITE SULLA TRATTA SPERIMENTALE A 11 GHz ROMA-MONTE S. PANCRAZIO]

Aldo Andreozzi, Dario DiZenobio, and Pier Giorgio Marchetti Dec. 1982 56 p refs In ITALIAN
(FUB-39-1982) Avail: NTIS HC A04/MF A01

A microwave data transmission facility is described and test results are given. The radio link is modulated in 4PSK at 140 Mbit/sec. Pluviometers were installed to relate signal depolarization and attenuation to rain events. A data acquisition system was implemented by a 16 bit minicomputer (HP1000/E) with 128 Kbytes RAM memory, a disk of 20 Mbyte and read-write magnetic tape. A block diagram of the data flow of the acquisition program is included. A simulation study covered multipath transmission with an echo. The results of the experiments show that the computerized acquisition system detects events which compare satisfactorily with those recorded in the chart system. Author (ESA)

N84-14412# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

DIGITAL MICROWAVE TRANSMISSION TESTS AT THE PACIFIC MISSILE TEST CENTER, PT. MUGU, CALIFORNIA

R. W. Hubbard Jun. 1983 70 p refs Sponsored in part by the Pacific Missile Test Center
(PB83-251454; NTIA/REPORT-83/126) Avail: NTIS HC A04/MF A01 CSCL 17B

An experiment designed to measure the performance of digital microwave radio systems in a line-of-sight (LOS) link that is subject to strong atmospheric multipath is discussed. The measurements made to characterize the propagation medium, the status of space-diversity receiver systems equipped with switched combiners, and the burst-error statistics caused by the multipath environment are discussed. The results presented compare the performance of two radios, operating simultaneously in the same trasmission channel. Author (GRA)

N84-14413 Texas Univ., Austin.

A STUDY OF MAGNETOTELLURIC FIELDS IN LATERALLY INHOMOGENEOUS EARTH MODELS Ph.D. Thesis

Ralph Clark Robertson 1983 155 p
Avail: Univ. Microfilms Order No. DA8319673

The effect of arbitrary lateral variations in the resistivity of the Earth dimensional Earth models which can be represented by the thin sheet approximation. An integral equation solution is obtained for the forward going problem of a plane wave normally incident on the surface of an Earth modeled by a uniformly conducting half-space containing a laterally varying thin sheet buried at an arbitrary depth. Numerical results are obtained by using a variation of the method of moments for thin sheets changing in both one and two lateral directions. Numerical results for the two dimensional case are confined to E Parallel polarization and a surface thin sheet. The effect of lateral resistivity variations on magnetotelluric data is considered. An examination of the surface electric field in wave number space yields a procedure for the interpretation of magnetotelluric data in the presence of a three dimensional Earth. Dissert. Abstr.

N84-14414 Catholic Univ. of America, Washington, D.C.

EFFECTS OF COCHANNEL INTERFERENCE ON QPSK SYSTEMS IN A NONLINEAR SATELLITE CHANNEL Ph.D. Thesis

Eui Kon Koh 1983 163 p
Avail: Univ. Microfilms Order No. DA8318799

In recent satellite communication systems development, the capacity of bandwidth limited communication satellites has been increased by utilizing frequencies more than once. Whether the potential increase in capacity can be realized depends on the amount of cross-polarization discrimination that can be achieved for the cochannel operation. Cross-polarization discrimination is a function of the quality of the antenna system and of the effect of the propagation medium on the polarization of the transmitted signal. A certain level of cochannel signal interference into desired channel is unavoidable for these frequency reuse systems. For a Time Division Multiple Access (TDMA) satellite system the Traveling Wave Tube Amplifier (TWTA) located in the satellite is operated at or near saturation. The non-linear behavior of this transponder amplifier generates amplitude and phase distortion for the composite signal consisting of the desired and cochannel signals and the uplink noise. Dissert. Abstr.

N84-14415 Ohio State Univ., Columbus.

CASCADED ADAPTIVE ARRAYS Ph.D. Thesis

Henry Stephen Eilts 1983 163 p
Avail: Univ. Microfilms Order No. DA8318347

One of the problems with the least mean square (LMS) adaptive array is limited dynamic range caused by eigenvalue spread of the input covariance matrix, A solution is to process the LMS input signals prior to the LMS processor in power inversion arrays. The power inversion arrays attenuate the more powerful signals, thereby reducing the LMS eigenvalue spread and extending the overall dynamic range. Systems of power inversion arrays followed by an LMS processor are termed cascaded adaptive arrays. This dissertation analyzes cascaded adaptive arrays. It is shown that many of these cascaded arrays possess the same steady state output as an independent LMS array. This is desireable because the LMS array maximizes signal to interference plus noise ratio in the output. Computer simulation of the transient response of cascaded arrays is also presented for simple cascaded arrays. The results are generalized to multi-element arrays. It is shown that it is possible in some cases to eliminate phase distortion of the desired signal caused by the adaption transient. Dissert. Abstr.

N84-14416 Ohio State Univ., Columbus.
ANALYSIS OF AIRBORNE ANTENNA PATTERN AND MUTUAL COUPLING AND THEIR EFFECTS ON ADAPTIVE ARRAY PERFORMANCE Ph.D. Thesis
Hsin-Hsien Chung 1983 285 p
Avail: Univ. Microfilms Order No. DA8318334

The uniform geometrical theory of diffraction (UTD) is employed in this high frequency study of airborne antenna radiation patterns. A numerical solution is developed to treat general type aircraft in which the fuselage is assumed to be a perfectly conducting composite prolate spheroid surface. The wings, stabilizers and cockpit are simulated by multiple finite flat plates. Various patterns are calculated for antennas mounted on a F-16 fighter and KC-135 aircraft. The validity of the solution is verified by comparing the computed results with scale model measurements. An element placement procedure for airborne adaptive arrays is presented and evaluated in terms of a practical example. The airborne antenna radiation pattern solution is used as the basic tool in developing this placement algorithm. It is shown using this algorithm that one is able to design a system to achieve the required minimum SINR performance as well as desired resolution using a highly thinned array. Dissert. Abstr.

N84-14417 Texas Univ., Austin.
THE LOCAL WAVENUMBER SPECTRUM AND ITS APPLICATIONS IN TURBULENCE AND NOISE Ph.D. Thesis
John Monteith Beall 1983 110 p
Avail: Univ. Microfilms Order No. DA8319561

This work introduces the concept of the local wavenumber and frequency spectrum, which can be estimated using a pair of spatially fixed, point data sources. The local wavenumber spectrum is shown to be equivalent to the conventional wavenumber and frequency spectrum, which is simply the Fourier transform of the time and space autocorrelation function, if the fluctuation satisfies certain assumptions characteristic of many plasma turbulence theories. Basically, the separate frequency components of the fluctuation must have an approximately sinusoidal spatial dependence with amplitudes and wavenumbers which are slowly varying compared to the mean wavenumber. Comparison of the wavenumber space moments of the two kinds of spectra provides a means of testing the reasonableness of this WKB-type model. Application of the local wavenumber spectrum is demonstrated using data from an RF-excited discharge plasma. Dissert. Abstr.

N84-14173*# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
VLF WAVE INJECTIONS FROM THE GROUND
R. A. Helliwell *In* ESA Active Expts. in Space Jul. 1983 p 3-9 refs (For primary document see N84-14172 05-12)
(Grants NGL-05-020-008; NSF DPP-80-22282; NSF DPP-80-22540)
Avail: NTIS HC A17/MF A01 CSCL 17B

N84-14174# Science Applications, Inc., McLean, Va.
REVIEW OF IONOSPHERIC VLF AND ELF GENERATION
K. Papadopoulos (Maryland Univ., College Park), K. Ko (Princeton Univ., N.J.), A. Rieman (Indian Inst. of Tech., New Delhi), and V. Tripathi *In* ESA Active Expts. in Space Jul. 1983 p 11-28 refs (For primary document see N84-14172 05-12)
(Contract N00014-83-C-2019)
Avail: NTIS HC A17/MF A01

N84-14175# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
RESULTS FROM WAVE INJECTION EXPERIMENTS ON THE PORCUPINE ROCKET
R. Pottelette (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), L. R. O. Storey, and J. Thiel (Groupe de Recherches sur l'Energetique des Milieux Ionises) *In* ESA Active Expts. in Space Jul. 1983 p 29-34 refs Sponsored by CNES (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14176# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
OBSERVATION OF WAVES INDUCED BY AN ARTIFICIAL ION BEAM IN THE IONOSPHERE
J. P. Lebreton, R. Pottelette (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), O. H. Bauer (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), J. M. Illiano (Centre de Recherches en Physique de l'Environnement, Saint-Maur, France), R. Treuman (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), and D. Jones (British Antartic Survey) *In* ESA Active Expts. in Space Jul. 1983 p 35-38 refs Sponsored by DFVLR and CNES (For primary document see N84-14172 05-12)
(Contract BMFT-Ref-01D0074A; BMFT-BV-14-B7-74)
Avail: NTIS HC A17/MF A01

N84-14180# Arecibo Ionospheric Observatory, Puerto Rico.
THE HF-ENHANCED PLASMA LINE
J. A. Fejer, C. A. Gonzales, H. M. Ierkic, M. Sulzer, F. T. Djuth (Aerospace Corp., Los Angeles), L. M. Duncan (LASL, N. Mex.), and J. P. Sheerin (Iowa Univ., Iowa City) *In* ESA Active Expts. in Space Jul. 1983 p 53-60 refs Sponsored by NSF (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14190# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
ON THE STIMULATED PRECIPITATION OF ELECTRONS AND THE MECHANISM OF WAVE GENERATION IN THE WHISTLER RANGE IN THE ARAKS EXPERIMENT
K. I. Gringauz, N. M. Shutte, N. I. Izhovkina (Academy of Sciences (USSR), Troitsk), and S. A. Pulinets (Academy of Sciences (USSR), Troitsk) *In* ESA Active Expts. in Space Jul. 1983 p 137-140 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-14418 California Univ., Los Angeles.
A LARGE AND SMALL SIGNAL CHARGE STORAGE MODEL FOR AN ENHANCEMENT MODE M.O.S. FIELD EFFECT TRANSISTOR Ph.D. Thesis
Randall Lynn Conilogue 1983 260 p
Avail: Univ. Microfilms Order No. DA8314650

In order to develop an acceptable model, two questions need to be satisfied, to eliminate past shortcomings in MOSFET charge modeling: (1) how does one partition the stored carrier charge of the MOSFET channel into individual source and drain components; and (2) what impact does this partitioning have upon equivalent small signal circuit capacitive elements. Both of these questions are answered in this charge model. This model, which is charge conservative, yields non-reciprocal inter-electrode capacitances and compares well with experiment. To answer question one accurately, a perturbation technique is applied to the current continuity equation in each of the various gate, channel, and bulk depletion regions to obtain the quasi-static charges associated with each of the four device terminals. In answer to question two, the small signal capacitive coefficients of each terminal (partial derivatives of the terminal charges with respect to the terminal voltages) are derived and compared with the measured values of inter-electrode capacitances. These measured capacitances give excellent match to theoretical calculation. Dissert. Abstr.

N84-14419 Polytechnic Inst. of New York, Brooklyn.
ROTATIONALLY SYMMETRIC ARRAYS OF APERTURES ON CONDUCTING SPHERICAL SURFACES Ph.D. Thesis
Probir Kumar Bondyopadhyay 1983 260 p
Avail: Univ. Microfilms Order No. DA8316752

Performance of rotationally symmetric arrays of apertures on conducting spherical surfaces has been investigated. Circular waveguide fed apertures are arranged in equispaced rings around the conducting spherical surface. The electromagnetic fields in the exterior spherical region as well as in the interior spherical cavity region are expanded in terms of spherical transmission lines modes whereas the aperture fields are expressed in terms of circular waveguide modes. The array problem is formulated assuming dominant TE sub 11 mode fields, in general dually polarized, at the apertures. M rings of N aperture elements each are considered. Consecutive rings are in general staggered. For each phase sequence excitation of the array, the array problem reduces to that of an unit cell spherical waveguide containing M apertures (angular frequency domain formulation). Alternatively, the same problem is formulated via unitary transformation in eigen basis of the original array admittance matrix (azimuthal angular domain formulation). Dissert. Abstr.

N84-14420 Rice Univ., Houston, Tex.
OPTIMAL APPROXIMATION ALGORITHMS FOR DIGITAL FILTER DESIGN Ph.D. Thesis
Junn-Kuen Liang 1983 193 p
Avail: Univ. Microfilms Order No. DA8314952

Several new algorithms are presented for the optimal approximation and design of various classes of digital filters. An iterative algorithm is developed for the efficient design of unconstrained and constrained infinite impulse response (IIR) digital filters. Both in the unconstrained and constrained cases, the numerator and denominator of the filter transfer function are designed iteratively by recourse to the Remez algorithm and to appropriate design parameters and criteria, at each iteration. This makes it possible for the algorithm to be implemented by means of a short main program which uses (at each iteration) the linear phase FIR filter design algorithm of McClellan et al. as a subroutine. The approach taken also permits the filter to be designed with a desired ripple ratio. Also, the algorithm determines automatically the minimum passband ripple corresponding to the prescribed orders and band edges of the filter. The filter is designed directly without guessing the passband ripple or stopband ripple. Dissert. Abstr.

N84-14421* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TUNED ANALOG NETWORK Patent
Leonard L. Kleinberg, inventor (to NASA) Issued 22 Nov. 1983 7 p Filed 10 Sep. 1981 Supersedes N82-10324 (20 - 01, p 0048)
(NASA-Case-GSC-12650-1; US-Patent-4,417,215;
US-Patent-Appl-SN-301077; US-Patent-Class-330-107;
US-Patent-Class-330-109) Avail: US Patent and Trademark Office CSCL 09C

A noninverting, direct current amplifier stage is cascaded into an integrator stage to form a two stage tuned network with a single input junction common to both stages. The network provides independent adjustment of center frequency, bandwidth and voltage gain. The insertion of a positive feedback loop between the stages provides a very narrow bandwidth network. The addition of back to back zener diodes between the common input node and ground converts the network into an oscillator.

Official Gazette of the U.S. Patent and Trademark Office

N84-14422* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADDITIVE FOR ZINC ELECTRODES Patent
Daniel G. Soltis, Dean W. Sheibley, and William J. Nagle, inventors (to NASA) Issued 29 Nov. 1983 4 p Filed 10 Jun. 1981 Supersedes N81-27597 (19 - 18, p 2506)
(NASA-Case-LEW-13286-1; US-Patent-4,418,130;
US-Patent-Appl-SN-272406; US-Patent-Class-429-206;
US-Patent-Class-429-229; US-Patent-Class-252-182.1) Avail: US Patent and Trademark Office CSCL 10C

A zinc electrode for alkaline cells includes up to about ten percent by weight of Ba(OH)2.8H2O with about five percent being preferred. The zinc electrode may or may not be amalgamated with mercury.

Official Gazette of the U.S. Patent and Trademark Office

N84-14423* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRICAL SELF-ALIGNING CONNECTOR Patent
Keith H. Clark and Donald R. Scott, inventors (to NASA) Issued 20 Dec. 1983 9 p Filed 30 Sep. 1982 Supersedes N83-29592 (21 - 18, p 2929)
(NASA-Case-MFS-25211-2; US-Patent-4,421,371;
US-Patent-Appl-SN-432057; US-Patent-Class-339-64M;
US-Patent-Class-339-258RR; US-Patent-Class-339-262RR) Avail: US Patent and Trademark Office CSCL 09A

A self-aligning electrical connector device includes a receptacle component having a conically contoured interior and a plug component having a correspondingly contoured conical body receivable in the receptacle component. The plug component has a number of spaced conductive ring elements with a mating face and the receptacle component includes corresponding spaced conductive ring elements providing mating interface with the mating face of the ring elements of the plug component when connected to it. Each ring element of the receptacle component has several segmented portions which defect downwardly when the plug component is inserted. A biasing force is asserted against the face of the ring elements of the plug component providing positive electrical contact and connection between the ring elements of the components.

Official Gazette of the U.S. Patent and Trademark Office

N84-14424* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTROL SYSTEM FOR AN INDUCTION MOTOR WITH ENERGY RECOVERY Patent
Frank J. Nola, inventor (to NASA) Issued 22 Nov. 1983 10 p Filed 19 Feb. 1982 Supersedes N82-22437 (20 - 13, p 1788) Continuation-in-part of US Patent Appl-SN-243683, filed 16 Mar. 1981 and US Patent Appl-SN-297524, 28 Aug. 1981
(NASA-Case-MFS-25477-1; US-Patent-4,417,190;
US-Patent-Appl-SN-350472; US-Patent-Appl-SN-243683;
US-Patent-Appl-SN-297524; US-Patent-Class-318-729;
US-Patent-Class-318-798; US-Patent-Class-318-806) Avail: US Patent and Trademark Office CSCL 10C

A control circuit for an induction motor powered system is disclosed in which a power factor controlled servo loop is used to control, via the phase angle of firing of a triac, the power input to the motor, as a function of load placed on the motor by machinery of the powered system. Then, upon application of torque by this machinery to the motor, which tends to overspeed the motor, the firing angle of the triac is automatically set to a fixed, and relatively short, firing angle.

Official Gazette of the U.S. Patent and Trademark Office

N84-14425# TRW Space Technology Labs., Redondo Beach, Calif. Applied Technology Div.
APPLICATIONS OF JOSEPHSON JUNCTION SQUIDS AND

ARRAYS Quarterly Progress Report, 1 Oct. 1982 - 28 Feb. 1983
A. H. Silver 31 Mar. 1983 18 p
(Contract N00014-81-C-0615)
(AD-A134114) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report covers the period from 1 October 1982 to 28 February 1983 following the period covered by the last annual progress report. This period included the preparation and submission of the draft of the annual report, presentation of the paper SQUID Voltage-Controlled-Oscillator to the 1982 Applied Superconductivity Conference, continued fabrication and measurement of the 9GHz SQUID VCO, and design of the DC SQUID and SQUID array configuration. In addition, a number of important additions and modifications were made in the basic laboratory facilities. Work has continued on fabrication and measurements of the single resistive SQUID VCO with the 50/1 transformer ratio operating near 9GHz. Four chips are fabricated on a wafer, with different damping resistors for each one of the four devices. GRA

N84-14426# State Univ. of New York at Buffalo, Amherst.
ARRAYS OF VERY SMALL VOLTAMMETRIC ELECTRODES BASED ON RETICULATED VITREOUS CARBON
Neal Sleszynski, Janet Osteryoung, and Malcolm Carter 14 Oct. 1983 37 p
(Contract N00014-79-C-0682)
(AD-A134031; TR-15) Avail: NTIS HC A03/MF A01 CSCL 09/3

Micro-electrode arrays constructed from reticulated vitreous carbon are described and characterized. Sterological analysis and cyclic voltammetric data indicate the arrays have equivalent radii as small as 32 microns, with densities as high as 1650 electrodes/sq cm. GRA

N84-14427# Utah Univ., Salt Lake City. Dept. of Bioengineering.
ELECTROCHEMISTRY OF CHEMICALLY SENSITIVE FIELD EFFECT TRANSISTORS Interim Technical Report
Jiri Janata 30 Sep. 1983 24 p
(Contract N00014-81-K-0664; Grant NSF CHE-78-00637)
(AD-A133984; TR-3) Avail: NTIS HC A02/MF A01 CSCL 09/1

It is shown that ISFETs are closely related to conventional ion selective electrodes. The time response characteristics of these devices are examined in detail. The possibility of their use as direct charge sensors is critically evaluated. Author (GRA)

N84-14428# Toledo Univ., Ohio. Dept. of Electrical Engineering.
STATISTICAL SIMULATION OF GaAs MESFETS Final Scientific Report, 1 Mar. 1982 - 31 Jul. 1983
Arthur R. Thorbjornsen 29 Aug. 1983 25 p
(Grant AF-AFOSR-0119-82; AF Proj. 2306)
(AD-A133923; UT-EE-83-21; AFOSR-83-0800TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method has been developed for the statistical simulation of gallium arsenide metal semiconductor field effect transistors. Simulated device parameter distributions were compared with measured parameter distributions using the Kolmogorov-Smirnov test. By adjusting the individual input parameter in a trial and error process, an acceptable simulation was obtained for the parameter distributions of five different devices. The correlation coefficients between device parameters produced in the simulation were acceptable except for one parameter. A set of equations was derived for computing the parameters of the Curtice GaAs MESFET model in terms of six standard measured device parameters. A comparison of simulated and measured Curtice model parameters for the five devices did not indicate an acceptable match. Author (GRA)

N84-14429# Electronic Systems Div., Hanscom AFB, Mass.
DERATED APPLICATION OF PARTS FOR (ELECTRONIC SYSTEM DIVISION) SYSTEMS DEVELOPMENT
Sep. 1983 45 p
(AD-A133880; ESD-TR-197) Avail: NTIS HC A03/MF A01 CSCL 09/1

This document establishes part derating to be implemented on AFSC/ESD contracts. These criteria were prepared for ESD by RADC/RB and reflect the design derating criteria prepared for them under contract F30602-81-V-0073, as well as other RADC data. Established derating values for the majority of parts in MIL-HDBK-217, and a suggested approach for verification of derating parameters are included. GRA

N84-14430# Cincinnati Univ., Ohio.
INTEGRATION OF DETECTORS WITH OPTICAL WAVEGUIDE STRUCTURES Interim Technical Report, 15 Mar. 1982 - 14 Mar. 1983
J. T. Boyd 15 May 1983 40 p
(Grant AF-AFOSR-0130-81; AF Proj. 2305)
(AD-A133855; AFOSR-83-0796TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

Progress in several areas regarding the integration of photodetector arrays with optical waveguide structures is presented. A photosensor element suitable for incorporation into charge-coupled device (CCD) imaging arrays in which the charge injected into the CCD is proportional to the logarithm of incident light intensity has been successfully demonstrated. The photosensor element consists of a photodiode directly coupled to a two stage MOSFET common source amplifier. This element occupies an area of 25 micron x 100 micron and is arranged so that it could be incorporated into a linear CCD imaging array having a period of 25 micron. A logarithmic response is measured over a 68.6 dB range of incident light intensity with a sensitivity of 55 mV per decade of light intensity. The concept of illuminating a silicon photodetector along an edge to increase the light propagation path through the depletion region and thus to increase quantum efficiency at near infrared wavelengths has also been successfully demonstrated. Quantum efficiency measurements using both a GaAlAs laser and a HeNe laser are included. These measurements show an improvement in quantum efficiency at lambda = 0.83 micron for edge illumination over normal incidence of 75% for a photodiode and of 142% for a MOS capacitor photosensor. GRA

N84-14431# Howard Univ., Washington, D. C. Dept. of Electrical Engineering.
DEVELOPMENT OF SHORT GATE FET'S Annual Report, Jun. 1980 - Jun. 1981
Michael G. Spencer 1983 23 p
(Grant AF-AFOSR-0223-81; AF Proj. 2305)
(AD-A133852; AFOSR-83-0766TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

A summary of initial work performed under Air Force contract 'Development of Short Gate Fet's' is presented. Approach taken toward fabrication of high speed fet's is discussed. Expected materials and fabrication problems are outlined. Author (GRA)

N84-14432# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
FAST CONVOLUTION ALGORITHMS AND ASSOCIATED VHSIC ARCHITECTURES Ph.D. Thesis. Final Report, 15 Apr. 1980 - 15 Apr. 1983
Irving S. Reed 23 May 1983 22 p
(Grant AF-AFOSR-0151-80; AF Proj. 2304)
(AD-A133851; AFOSR-83-0748TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

Abstracts are presented for 48 papers and 6 dissertations generated under the grant. Topics covered include: (1) methods to find primitive elements (Mersene prime) in certain finite fields; (2) number theoretic transforms, hybrid algorithms, and a fast polynomial transform algorithm for digital filtering in speech, radar, communication and image processing; (3) a number theoretic transform decoder for correcting both errors and erasures of the Reed-Solomon error correcting code; (4) three dimensional reconstruction for X-rays and radar; and (5) an inner product computer, Galois switching theory, and a cryptographic construct for computer system security and multiuser secure communications networks. Author (GRA)

N84-14433# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FUNCTIONAL ELECTRONIC AMPLIFIERS WITH BROAD DYNAMIC BAND
V. M. Volkov 27 Sep. 1983 630 p Transl. into ENGLISH of the mono. "Funktsionalnyye Elektronnyye Usiliteli s Shirokim Dinamicheskim Diapazonom" Kiev, 1967 p 1-342
(AD-A133774; FTD-ID(RS)T 1380-83) Avail: NTIS HC A99/MF A01 CSCL 09/5

Methods of obtaining the functional amplitude characteristics in amplifiers; functional amplifiers with nonlinear elements; functional amplifiers with automatic gain control; functional amplifiers with the addition of output effects; transient processes in functional amplifiers with the nonlinear elements; and calculation, tuning adjustment of functional amplifiers are considered. Author

N84-14434# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Computer Science.
A KNOWLEDGE BASED APPROACH TO VLSI CAD Interim Technical Report
Louis I. Steinberg and Tom M. Mitchell Sep. 1983 21 p
(Contract N00014-81-K-0394; ARPA Order 4147)
(AD-A133692; Rept-4-25664) Avail: NTIS HC A02/MF A01 CSCL 09/5

Artificial Intelligence (AI) techniques offer one possible avenue toward new CAD tools to handle the complexities of VLSI. This paper summarizes the experience of the Rutgers AI/VLSI group in exploring applications of AI to VLSI design over the past few years. In particular, it summarizes our experience in developing REDESIGN, a knowledge-based system for providing interactive aid in the functional redesign of digital circuits. Given a desired change to the function of a circuit, REDESIGN combines rule-based knowledge of design tactics with its ability to analyze signal propagation through circuits, in order to (1) help the user focus on an appropriate portion of the circuit to redesign, (2) suggest local redesign alternatives, and (3) determine side effects of possible redesigns. We also summarize our more recent research toward constructing a knowledge-based system for VLSI design and a system for chip debugging, both based on extending the techniques used by the REDESIGN system. Author (GRA)

N84-14435# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
BASIC EMC TECHNOLOGY ADVANCEMENT FOR C3 SYSTEMS. VOLUME 2A: MACROMODELS OF OP AMPS FOR CADA APPLICATIONS Final Technical Report, Jun. 1981 - Sep. 1983
James C. Bowers Griffiss AFB, N.Y. RADC Apr. 1983 82 p 6 Vol.
(Contract F30602-81-C-0062; AF Proj. 2338)
(AD-A133661; RADC-TR-82-286-Vol-2A) Avail: NTIS HC A05/MF A01 CSCL 09/5

A macromodel of an amp is considered which will simplify circuit analysis. The macromodel, the selection of device parameters within the model and mode realization are considered. Some examples of application are considered. This is Volume 2A of a six-volume final report. Volumes 4A, B, and C have already been published. These volumes deal with: Vol. 1 - methodology to relate EMI criteria to microelectronic circuit performance measures; Vol. 2- methods to analyze these circuits; Vol. 3 - defining method for writing EMC specifications related to performance measurements; Vol. 4 - EM coupling and testing- mostly near field coupling; Vol. 5 - coupling between wires and boxes when the distance are greater; Vol. 6 - the FORTRAN 4 computer code implementation of the modules developed in Vol. 5. GRA

N84-14436# Pennsylvania State Univ., University Park.
PARAMETRIC ACOUSTIC ARRAY FORMATION VIA WEAK COLLINEAR AND NONCOLLINEAR INTERACTION IN DISPERSIVE FLUIDS Final Report, 1 Aug. 1979 - 30 Sep. 1983
Julian D. Maynard Sep. 1983 12 p
(Contract N00014-79-C-0624)
(AD-A133660) Avail: NTIS HC A02/MF A01 CSCL 09/5

This final report contains a historical review of the technical and administrative highlights of the research project. Briefly, the project was a theoretical investigation of the effects of dispersion on the nonlinear formation of a difference-frequency beam from two primary beams. The approach involved both analytical and numerical solutions to the nonlinear and dispersive paraxial wave equation with emphasis on Guassian beam solutions. In the case of collinear primary beams, known results were reproduced, but with some siginificant errors corrected. Noncollinear interaction of finite width beams was investigated for the first time in this project. Some unexpected results were discovered in this case: it was found that the finite beam width caused the difference beam to have directivity maximum near the axis of the primaries, rather than in the direction of the primary wave-vector difference, and decreased the conversion efficiency to significantly below the plane-wave efficiency. Further research in this area is indicated. GRA

N84-14437# TRW, Inc., El Segundo, Calif.
OPTICAL ANALOG REPEATER DEVELOPMENT FOR A ONE GHZ BANDWIDTH RECIRCULATING DELAY LINE Final Report, Aug. 1982 - Aug. 1983
T. V. Muoi Sep. 1983 65 p
(Contract N00014-82-C-2285)
(AD-A133658) Avail: NTIS HC A04/MF A01 CSCL 09/1

This report is the Final Report of a twelve-month program to develop an analog optical repeater for a 1 GHz-bandwidth recirculating delay line. The feasibility of using single mode fibers as the delay medium for a recirculating delay line of 1 GHz bandwidth and 1 ms delay time is investigated both theoretically and practically. Expected performances at both 1.3 micron and 1.5 micron wavelength with state-of-the-art optical components are indicated. Several key components that are essential for the delay line realization have been demonstrated. Optical receivers and transmitters with bandwidth exceeding 2 GHz have been achieved. GRA

N84-14438# Battelle Columbus Labs., Durham, N. C.
WORKSHOP ON REPETITIVE SPARK GAP OPERATION Final Report
Marion O. Hagler and M. Kristiansen 20 May 1983 367 p Workshop held in Tamarron, Colo., 17-19 Jan. 1983
(Contract DAAG29-81-D-0100)
(AD-A132688) Avail: NTIS HC A16/MF A01 CSCL 09/1

A workshop on Repetitive Spark Gap Operation was conducted by Texas Tech University for the Department of Defense. The workshop objectives were to summarize the present state-of-the-art and knowledge about repetitive spark gap operation and to make recommendations about needed research in this important pulsed power area. A group of invited papers provided background information for the participants who were experts in various important working groups which provided summary reports about their deliberations and recommendations. These papers and group reports are included in this report together with a summary of the workshop recommendations. Author (GRA)

N84-14439# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM AND T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Apr. - 30 Jun. 1983
F. M. Bruno 30 Jul. 1983 14 p
(Contract DAAK70-80-C-0168)
(AD-A132797; TEI-A009-11; QR-11) Avail: NTIS HC A02/MF A01 CSCL 09/1

The object of this study is to develop design, performance, and test specifications for the Miniature Cathode Ray Tube (CRT) assembly suitable for use in the Integrated Helmet and Display Sight System (IHADSS) of the Army Advanced Attack Helicopter (AAH). Author (GRA)

N84-14440# Naval Research Lab., Washington, D. C.
DIELECTRIC RESONATORS FOR USE IN MICROWAVE AND MILLIMETER-WAVE GaAs CIRCUITS
B. E. Spielman and H. E. Heddings 2 Sep. 1983 36 p
(RR0210346)
(AD-A132881; NRL-MR-5156) Avail: NTIS HC A03/MF A01
CSCL 09/5

This report represents the results of an investigation of dielectric resonators to be processed in GaAs substrates for application to microwave and millimeter-wave monolithic integrated circuits. Zeroth-and first order analyses are described. These analyses are applied to dielectric resonator structures to be formed in GaAs substrate material by etching an annular gap in the substrate, thereby effectively leaving a circular cylindrical disc of dielectric material to function as a resonator. Plots of geometric parameter variations with frequency are provided for these resonator structures. Tables are presented to show specific resonant structures for frequency-scaled microwave and non-scaled millimeter-wave resonators. Results are discussed, conclusions drawn, and suggestions for further work set forth. Author (GRA)

N84-14441# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.
CATHODE DRIVEN HIGH GAIN CROSSED-FIELD AMPLIFIER Quarterly Report, Mar. - May 1983
15 Jul. 1983 22 p
(Contract N00039-79-C-0295)
(AD-A133030; Pt-6369; QR-15) Avail: NTIS HC A02/MF A01
CSCL 09/1

The objective of this three-phase program is to achieve the design of a cathode driven high gain re-entrant Crossed Field Amplifier capable of meeting the parameters of Raytheon Company specification No. 968838 dated 10 May 1978. The effort includes the fabrication and test of three developmental and four final configuration tubes. One final configuration tube will be life tested and two will be delivered to the Navy. The tasks discussed during this report period relate to the cold tests performed on various subassemblies of model no. 4 and on the sealed-in model no. 4 of the S-band high gain cathode driven crossed field amplifier. Based on the performance of model no. 3 certain remedial measures have been implemented in model no. 4 that have resulted in the elimination of key resonances within the tube and an improvement in the isolation between the cathode and anode circuits. GRA

N84-14442# Maxwell Labs., Inc., San Diego, Calif.
CAPACITOR HARDNESS DEMONSTRATION PROGRAM Final Report, Sep. 1980 - Apr. 1982
Allen Ramrus and Wayne White Aug. 1983 92 p
(Contract F04611-80-C-0048; AF Proj. 3058)
(AD-A133045; MLR-1339A; AFRPL-TR-82-090) Avail: NTIS HC A05/MF A01 CSCL 09/1

This final report describes discharge-life tests on capacitors which use polyvinylidene fluoride (PVDF) as the principal dielectric. Discharge-life tests on all-film capacitors impregnated with silicone oil and recent tests on PDVF/paper capacitors impregnated with castor oil are described. The manufacturing procedure of vacuum-qualified PVDF/paper/castor oil capacitors is discussed. GRA

N84-14443# Los Alamos Scientific Lab., N. Mex.
USING PHOTOCONDUCTIVITY TO IMPROVE IMAGE-TUBE GATING SPEEDS
P. L. Gobby, G. J. Yates, S. A. Jaramillo, B. W. Noel, and I. Aeby 1983 4 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-21 Oct. 1983
(Contract W-7405-eng-36)
(DE84-001732; LA-UR-83-3060; CONF-831015-12) Avail: NTIS HC A02/MF A01

A technique using the photoconducting of semiconductor and insulator photocathodes to improve image tube gating speeds is presented. A simple model applicable to the technique and a preliminary experiment are described. DOE

N84-14444# Exide Management and Technology Co., Yardley, Pa.
RESEARCH, DEVELOPMENT AND DEMONSTRATION OF ADVANCED LEAD-ACID BATTERIES FOR UTILITY LOAD LEVELING Final Report
Aug. 1983 246 p refs
(Contract W-31-109-eng-38)
(DE84-002683; ANL/OEPM-83-6) Avail: NTIS HC A11/MF A01

An advanced lead acid storage battery was developed to the preprototype cell and module design stage. Each module is equipped with a low cost tray, automatic watering system, and air-lift pumps for increased acid circulation in each cell. With the qualified alloy catastrophic positive grid corrosion will not limit cell cycle life. An accelerated shallow cycle regime at room ambient tested 60 cell designs for the active material shedding failure mode. It is found that an antishedding active material additive reduces positive active material shedding significantly and extend the cycle life of both the positive and the negative plate. Equations relating cell design to deep cycle life are developed from the factorial tests on the 60 cells. DOE

N84-14445# Argonne National Lab., Ill. Chemical Technology Div.
ADVANCED FUEL-CELL DEVELOPMENT Progress Report, Apr. - Jun. 1982
R. D. Pierce, A. M. Briendel, T. D. Kaun, G. H. Kucera, J. W. Sim, J. L. Smith, and J. R. Stapay Sep. 1983 30 p refs
(Contract W-31-109-eng-38)
(DE84-002685; ANL-83-67) Avail: NTIS HC A03/MF A01

Fuel cell research and development activities are described. Alternative cathode materials to NiO for molten carbonate fuel cells are investigated. The alternative cathode candidate materials are synthesized and pressed into discs for testing of their conductivity and stability. It is recommended that Ca1 7Y0 3MnO4 is further studied as a cathode material. Solubility data were taken for NiO in a cathode environment and shown to vary inversely with temperature from 823 to 1017 K. DOE

N84-14446# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Components Div.
TRANSMISSION LINES FOR PULSED POWER APPLICATIONS
Malcolm T. Buttram Oct. 1983 76 p refs
(Contract DE-AC04-76DP-00789)
(DE84-002754; SAND-83-0957) Avail: NTIS HC A05/MF A01

For pulsed power applications, transmission lines serve two generic functions. They are used to transmit pulses with high fidelity and with a fixed propagation delay. This propagation delay and the characteristic impedance complete characterize the transmission line to a reasonable first approximation. With suitable switching, transmission lines are also used to shape submicrosecond pulses. The characteristic pulse length produced when a transmission line is used for pulse shaping is twice its propagation delay. Lossy and lossless transmission lines, transmission line transformers, line geometries, pulse inversion, and pulse forming line charging and prepulse are examined. DOE

N84-14447# California Univ., Livermore. Lawrence Livermore Lab. Materials Fabrication Div.
COMPLIANCE CHECK ON JAPAX ELECTRICAL-DISCHARGE-WIRE MACHINE
Joseph Martinez 15 Jun. 1983 14 p Presented at the Interagency Manufacturing Operations Group Meeting, Denver, 15 Jun. 1983
(Contract W-7405-eng-48)
(DE84-001430; UCRL-89739; CONF-8306132-1) Avail: NTIS HC A02/MF A01

The checkout of a wire electrical discharge machine at a factory in Japan, specifically of the mechanical accuracy of parts is described. DOE

N84-14448# Goerz (Jerry W.), Lexington, Ky.
IMPROVED GENERATOR FOR USE WITH LOW-SPEED ROTATING MACHINES Final Report
J. W. Goerz 31 Mar. 1983 17 p

(Contract DE-FG44-80R4-10249)
(DE84-000375; DOE/R4-10249/T1) Avail: NTIS HC A02/MF A01

A low technology, maintenance free DC electrical generator suited for use with low speed rotating machines such as windmills or waterwheels was constructed. The generator consists of permanent magnets affixed to the circumference of the rotating device, and stationary coils mounted on a semicircular frame. As the device rotates, the magnets move past the coils and magnetically induce an AC voltage in the coils. This voltage is rectified and stored in a battery. No gears, belts, or bushes are used. By mounting the magnets at the circumference of the rotating device high relative velocities between magnets and coils even at slow rotations are achieved to extract energy from very light winds or slowly flowing water. The generator easily reaches charging voltages at low speeds, and operates quietly without mechanical wear. But the charging current is very low in comparison to a wind turbine of conventional design. DOE

N84-14449# Los Alamos Scientific Lab., N. Mex.

THE 240-kA SWITCH WITH POTENTIAL APPLICATION IN ELECTROMAGNETIC-LAUNCH SYSTEMS

E. M. Honig 1983 5 p refs Presented at the 2nd Symp. on Electromagnetic Launch Technol., Boston, Mass., 10-14 Oct. 1983
(Contract W-7405-eng-36)
(DE84-001174; LA-UR-83-2710; CONF-8310164-3) Avail: NTIS HC A02/MF A01

The performance of rod array triggered vacuum gap (RATVG) switches and their potential for solving switching problems in EM launcher are discussed. A new mode of operation for the RATVG switch is proposed. Fundamental considerations for the operation of opening switches and their associated tranfer circuits are presented. Methods of recovering the railgun's inductive energy to enable efficient repetitive operation are discussed and new circuits with such capability are proposed. DOE

N84-14450# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).

STUDY OF A GRAVITATIONAL ANTENNA COUPLED TO A RESONANT CAPACITIVE TRANSDUCER: EQUIVALENT CIRCUIT AND NOISE SPECTRA [STUDIO DI UN'ANTENNA GRAVITAZIONALE ACCOPPIATA AD UN TRASDUTTORE CAPACITIVO RISONANTE: CIRCUITO EQUIVALENTE E SPETTRI DI RUMORE]

M. G. Castellano and C. Cosmelli (Rome Univ.) Mar. 1982 33 p refs In ITALIAN
(IFSI-82-3) Avail: NTIS HC A03/MF A01

The physical system formed by a gravitational antenna and the transducer coupled to a tension amplifier is analyzed. Using the equivalent circuit, the outlet noise contributions of the Brownian noise of the mechanical elements and the Johnson noise of the electrical elements are computed. The transfer functions are calculated for the general case of the antenna and the transducer not perfectly matched and with different Q factors. The graphics for the computed noise spectra of a 2500 kg antenna are presented. The parameters of the oscillators corresponding to the normal modes and the analytical expressions of the associated spectra are deduced. Author (ESA)

N84-14451# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).

DOUBLE PARAMETRIC OSCILLATOR [DOPPIO OSCILLATORE PARAMETRICO]

F. Fuligni Jan. 1983 15 p refs In ITALIAN
(IFSI-83-1) Avail: NTIS HC A02/MF A01

A simple calculation of the dynamic and noise characteristics of a parametric converter is presented. The system is composed of two harmonic oscillators with different frequency and mass coupled by a spring whose elastic constant varies harmonically at a third frequency equal to the sum or difference of the other two. For a gravitational antenna (first oscillator) coupled to an LC circuit (second oscillator) the analytical expressions show that the reaction time of the LC circuit could be too long, and can be diminished if its frequency is very high. A simplified analysis gives the noise components and signal strength for the case of the gravitational antenna. Author (ESA)

N84-14452# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).

LOW NOISE AMPLIFIER WITH A JFET INLET STAGE [AMPLIFICATORE A BASSO RUMORE CON STADIO D'INGRESSO A JFET]

G. Martinelli and G. Vannaroni Aug. 1983 26 p refs In ITALIAN
(IFSI-83-8) Avail: NTIS HC A03/MF A01

A low noise preamplifier for general use in laboratory was developed using the good noise characteristics offered by field effect transistors. The base circuit is a transconductance amplifier which uses a J-FET, followed by a current-tension converter implemented with an operational amplifier. The total gain is adjustable from 40 to 200 V/V and the bandpass is from 5 Hz to 50 KHz. The resulting noise characteristics are considerably better than the PAR 113 commercial amplifier which is used as a reference. Author (ESA)

N84-14453# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.

MAINTENANCE FREE LEAD ACID BATTERY WITH HIGH CYCLE LIFE AND A NEW TYPE OF GRID Final Report, Jan. 1982

Femi Nilmen, Hans-Peter Sattler, and Eberhard Nann (Akkumulatorenfabriken Wilhelm Hagen AG) Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 150 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-156; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

Grid and active mass materials for maintenance free lead acid batteries with high cycle life are discussed. Alloys for casting and expanding materials for the grids were manufactured. With low grade Sb alloys (< 1,5 %) and PbCa alloys, energy densities of 50 Wh/kg are reached. Improved insulation, corrosion resisting alloys and inhibitors as well as suitable mass materials increase cycle life by 700. Manufacturing costs are similar to starting battery manufacturing costs. Expanded metal grids and plates of the most suitable alloys were produced. Author (ESA)

N84-14454# National Bureau of Standards, Washington, D.C. National Engineering Lab.

SEMICONDUCTOR MEASUREMENT TECHNOLOGY: A FORTRAN PROGRAM FOR ANALYSIS OF DATA FROM MICROELECTRONIC TEST STRUCTURES Final Report

Richard L. Mattis Jul. 1983 66 p refs
(PB83-263764; NBS-SP-400-75; LC-83-600548) Avail: NTIS HC A04/MF A01 CSCL 09A

A computer program, STAT2, is described which performs the following functions: reads data as a two dimensional array; calculates mean, sample standard deviation, and median; identifies outliers; calculates replacement values for outliers; makes a gray-tone, numerical and contour data map on a line printer; makes a numerical map on the user's terminal, makes a histogram on a line printer; constructs a data base for examining correlations among various data sets; and searchers the data base for correlation using several selective keys. The emphasis is on program usage, and detailed descriptions of the commands are given. Data input requirements are addressed. Guidance regarding several types of program modifications is provided. Author (GRA)

N84-14455 Stanford Univ., Calif.

A CLOCKING DISCIPLINE FOR TWO-PHASE DIGITAL INTEGRATED CIRCUITS Ph.D. Thesis

David Cooke Noice 1983 101 p
Avail: Univ. Microfilms Order No. DA8314482

Sooner or later a designer of digital circuits must face the problem of timing verification so he can avoid errors caused by clock skew, critical races, and hazards. Unlike previous verification methods, such as timing simulation and timing analysis, the approach presented here guarantees correct operation despite uncertainty about delays in the circuit. The result is a clocking discipline that deals with timing abstractions only. It is not based on delay calculations; it is only concerned with the correct, synchronous operation at some clock rate. Accordingly, it may be used earlier in the design cycle, which is particularly important to integrated circuit designs. The clocking discipline consists of a notation of clocking types, and composition rules for using the types. Together, the notation and rules define a formal theory of two phase clocking. The notation defines the names and exact characteristics for different signals that are used in a two phase digital system. The notation makes it possible to develop rules for propagating the clocking types through particular circuits.

Dissert. Abstr.

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-14456 Texas Univ., Austin.
COMPUTATION OF COMPRESSIBLE FLOWS USING FINITE ELEMENTS AND OPTIMIZATION TECHNIQUES Ph.D. Thesis
Ten-Tial Pan 1983 168 p
Avail: Univ. Microfilms Order No. DA8319656

A variational formulation for compressible subcritical flows, shocked transonic flows and shockless transonic flows is developed using a special class of fictitious gas to regularize the local supersonic flow of the flow field. A technique to enforce the Kutta-Joukowski condition at the trailing edge of a lifting airfoil is introduced and the variational formulation is extended to treat lifting problems. The existence and uniqueness of the solution for the subcritical problem or the regularized transonic problem follow from an application of standard results from convex analysis. The finite element method is used to approximate the problem and optimization algorithms are introduced to compute the flow field. Numerical examples are computed and compared with either wind tunnel data or those obtained by other numerical methods. The method of characteristics is used in the supersonic pocket as part of the analysis to compute new shockless airfoils for shock-free airfoil designs or shock waves in shocked flow studies.

Dissert. Abstr.

N84-14457 Princeton Univ., N. J.
A SOLUTION-ADAPTIVE FINITE-VOLUME ALGORITHM WITH APPLICATION TO PROBLEMS IN PLANETARY ENTRY Ph.D. Thesis
Peter Anthony Gnoffo 1983 165 p
Avail: Univ. Microfilms Order No. DA8318702

The development of a fully vectorized, solution-adaptive grid, finite-volume algorithm for the numerical solution of the Navier Stokes equations is presented. The formulation is an explicit, alternation two-step scheme which uses local maximum time advancement at every cell to accelerate convergence to the steady state. The grid adaption algorithm is a self-contained implicit routine which can rezone the computational domain either interactively with or independently of the host finite-volume code. The presentation includes an analysis of numerical errors introduced by rapid variation in cell shape and size and by the use of local maximum time advancement. The approach emphasizes the approximation of the integral form of the conservation equations on well defined cells for the purpose of guaranteeing cell-to-cell conservation of mass, momentum, and energy; and for uniquely defining the proper difference formulation of the metric coefficients over complex geometric domains. The relation between finite-difference and finite-volume relations is discussed.

Dissert. Abstr.

N84-14458 Dayton Univ., Ohio.
ON THE APPLICATION OF HOLOGRAPHIC INTERFEROMETRY TO AXISYMMETRIC AIR FLOWS Ph.D. Thesis
Albert George Havener 1983 176 p
Avail: Univ. Microfilms Order No. DA8314179

While the resolve of interferometric measurements of general, three dimensional asymmetric flow fields requires the use of multiple views of the fields, most wind tunnel applications are limited to a single view along a single line of sight through the field. For this restriction, the reduction of interferometric measurements is limited to axisymmetric flows. Accordingly, this research is directed toward resolving basic problems associated with the reduction of interferometric data of real, axisymmetric flows. The problem of coping with insufficient optical data is resolved by the development of an interferometric measuring technique that has a pseudo-continuous measuring resolution of 15 microns, the problem of suppressing the amplification of noise and scatter in the optical data is resolved by developing a general numerical data reduction process, a method for isolating flow fields that are interior to central fields is developed, a unique computational interferometer process applicable to the study of asymmetric flows is developed, and direct experimental application is made to supersonic boundary layer flow on sharp tip cons. Dissert. Abstr.

N84-14459 California Univ., Los Angeles.
AN EXPERIMENTAL STUDY OF THE RESPONSE OF A NEARLY ISOTROPIC GRID TURBULENCE TO A SPECTRALLY LOCAL DISTURBANCE AND AN INVESTIGATION OF THE COHERENT STRUCTURES ASSOCIATED WITH A TURBULENT SPOT IN A LAMINAR BOUNDARY LAYER Ph.D. Thesis
Eric Christian Itsweire 1983 232 p
Avail: Univ. Microfilms Order No. DA8315174

The response of two laboratory flows to local perturbations, one in wavenumber space and the other in time, is investigated. First, a grid-generated, nearly isotropic turbulence was subjected to a spectrally local disturbance in the lateral (y) direction. A nearly sinusoidal ripple in the mean velocity was created by placing a low solidity screen (called a 'zither' by Kellogg and Corrsin (1965) downstream of a classical biplane grid. Simultaneous measurements of the longitudinal and lateral velocity components show strong periodic oscillation of all second order moments. After a short period of initial growth, the longitudinal power spectrum E sub 11 E (K sub 1) exhibits an unusual decay behavior at downstream locations for which the Reynolds stress created by the zither has vanished. Bispectra and one dimensional transfer terms show an increase energy transfer from lower to higher wavenumbers, but do not provide evidence of any preferred interaction between longitudinal wavenumbers. Dissert. Abstr.

N84-14460 Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
DYNAMICS OF A MOBILE TANK PARTIALLY FILLED WITH LIQUID: EQUATIONS OF MOTION AND THEIR LINEARIZATION
Aleksander Kornecki Waterloo, Ontario Waterloo Univ. Sep. 1982 30 p refs
(WU-Paper-174; ISSN-0317-7130) Copyright. Avail: Issuing Activity

The rotational motion of an incompressible inviscid liquid contained in a mobile tank of arbitrary shape is considered. The hydrodynamic equations are derived by reference to a coordinate system moving with the tank. The equations are linearized by a perturbation method and the limitations of the linearized theory are determined. As an example, small forced oscillations of a rectangular tank are analyzed. The obtained solution is compared with other known solutions to this problem. Author

N84-14461* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THERMAL CONTROL SYSTEM Patent

Dennis R. Hewitt, inventor (to NASA) Issued 13 Dec. 1983 12 p Filed 15 Oct. 1982 Supersedes N83-12361 (21 - 03, p 0366) (NASA-Case-GSC-12771-1; US-Patent-4,420,035; US-Patent-Appl-SN-434672; US-Patent-Class-165-32; US-Patent-Class-165-41; US-Patent-Class-165-96) Avail: US Patent and Trademark Office CSCL 20M

The temperature of an exothermic process plant carried aboard an Earth orbiting spacecraft is regulated using a number of curved radiator panels accurately positioned in a circular arrangement to form an open receptacle. A module containing the process is insertable into the receptacle. Heat exchangers having broad exterior surfaces extending axially above the circumference of the module fit within arcuate spacings between adjacent radiator panels. Banks of variable conductance heat pipes partially embedded within and thermally coupled to the radiator panels extend across the spacings and are thermally coupled to broad exterior surfaces of the heat exchangers by flanges. Temperature sensors monitor the temperature of process fluid flowing from the module through the heat exchanges. Thermal conduction between the heat exchangers and the radiator panels is regulated by heating a control fluid within the heat pipes to vary the effective thermal length of the heat pipes in inverse proportion to changes in the temperature of the process fluid.

Official Gazette of the U.S. Patent and Trademark Office

N84-14462*# Scientific Research Associates, Inc., Glastonbury, Conn.

FURTHER DEVELOPMENT OF A METHOD FOR COMPUTING THREE-DIMENSIONAL SUBSONIC VISCOUS FLOWS IN TURBOFAN LOBE MIXERS Final Report

Shyi-Jang Lin, J. P. Kreskovsky, W. R. Briley, and H. McDonald Nov. 1983 66 p refs
(Contract NAS3-22758)
(NASA-CR-168304; NAS 1.26:168304; R83-900011-F) Avail: NTIS HC A04/MF A01 CSCL 20D

Procedure for computing subsonic, turbulent flow in turbofan lobe mixers was extended to allow consideration of flow fields in which a swirl component of velocity may be present. Additional, an optional k-lambda turbulence model was added to the procedure. The method of specifying the initial flow field was also modified, allowing parametric specification or radial secondary flow velocities, and making it possible to consider initial flow fields which have significant inlet secondary flow vorticity. A series of example calculations was performed which demonstrate the various capabilities of the modified code. These calculations demonstrate the effects of initial secondary flows of various magnitudes, the effects of swirl, and the effects of turbulence model on the mixing process. The results of these calculations indicate that the initial secondary flows, presumed to be generated within the lobes, play a dominant role in the mixing process, and that the predicted results are relatively insensitive to the turbulence model used.

Author

N84-14463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HEAT TRANSFER DISTRIBUTIONS AROUND NOMINAL ICE ACCRETION SHAPES FORMED ON A CYLINDER IN THE NASA LEWIS ICING RESEARCH TUNNEL

G. J. VanFossen, R. J. Simoneau, W. A. Olsen, and R. J. Shaw 1984 19 p refs Presented at the 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984; sponsored by AIAA
(NASA-TM-83557; E-1905; NAS 1.15:83557) Avail: NTIS HC A02/MF A01 CSCL 20D

Local heat transfer coefficients were obtained on irregular cylindrical shapes which typify the accretion of ice on circular cylinders in cross flow. The ice shapes were grown on a 5.1 cm (2.0 in.) diameter cylinder in the NASA Lewis Icing Research Tunnel. The shapes were 2, 5, and 15 min accumulations of glaze ice and 15 min accumulation of rime ice. Heat transfer coefficients were also measured around the cylinder with no ice accretion. These icing shapes were averaged axially to obtain a nominal shape of constant cross section for the heat transfer tests. Heat transfer coefficients around the perimeter of each shape were measured with electrically heated copper strips embedded in the surface of the model which was cast from polyurethane foam. Each strip contained a thermocouple to measure the local surface temperature. The models were run in a 15.2 x 68.6 cm (6 x 27 in.) wind tunnel at several velocities. Background turbulence in the wind tunnel was less than 0.5 percent. The models were also run with a turbulence producing grid which gave about 3.5 percent turbulence at the model location with the model removed. The effect of roughness was also simulated with sand grains glued to the surface. Results are presented as Nusselt number versus angle from the stagnation line for the smooth and rough models for both high and low levels of free stream turblence. Roughness of the surface in the region prior to flow separation plays a major role in determining the heat transfer distribution.

R.J.F.

N84-14464*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HIGHER-ORDER DERIVATIVE CORRELATIONS AND THE ALIGNMENT OF SMALL-SCALE STRUCTURES IN ISOTROPIC NUMERICAL TURBULENCE

Robert A. Kerr Dec. 1983 67 p refs
(NASA-TM-84407; A-9481; NAS 1.15:84407) Avail: NTIS HC A04/MF A01 CSCL 20D

In a three dimensional simulation higher order derivative correlations, including skewness and flatness factors, are calculated for velocity and passive scalar fields and are compared with structures in the flow. The equations are forced to maintain steady state turbulence and collect statistics. It is found that the scalar derivative flatness increases much faster with Reynolds number than the velocity derivative flatness, and the velocity and mixed derivative skewness do not increase with Reynolds number. Separate exponents are found for the various fourth order velocity derivative correlations, with the vorticity flatness exponent the largest. Three dimensional graphics show strong alignment between the vorticity, rate of strain, and scalar-gradient fields. The vorticity is concentrated in tubes with the scalar gradient and the largest principal rate of strain aligned perpendicular to the tubes. Velocity spectra, in Kolmogorov variables, collapse to a single curve and a short minus 5/3 spectral regime is observed.

E.A.K.

N84-14465# Harry Diamond Labs., Adelphi, Md.

FLUIDICS: BASIC COMPONENTS AND APPLICATIONS

James W. Joyce Aug. 1983 24 p Original contains color illustrations
(DA Proj. 1L1-61102-AH-44)
(AD-A134046; HDL-SR-83-9) Avail: NTIS HC A02/MF A01 CSCL 13/7

Since its discovery at Harry Diamond Lab. in 1959, fluidics has gradually been developed into a viable technology. This report describes fluidic components and systems now in use or ready for use in many applications. The fluidic technology provides sensing, computing, and controlling functions with fluid power through interaction of fluid streams. Since fluidics can perform these functions without mechanical moving parts that will wear out, it has the advantages of simplicity and reliability. Other advantages are the low cost, environmental insensitivity, and safety of fluidic systems. Commercial applications of fluidics in the aerospace industry, include medicine, and personal-use items. The first aerospace application in production in the United States was for the thrust-reverser control for a DC-10 airplane. In industry, fluidics has been applied to air-conditioning controls, machine controls, process controls, and production-line controls. One of the first commercial applications of fluidics was for life-support medical equipment. For military use, fluidics has been successfully applied to a fluidic generator to convert pneumatic energy into electrical energy, a fluidic stability augmentation system for helicopters, and a pressure-regulating system for aircraft. Under development are rate sensing circuits for roll rate control of cannon-launched guided projectiles and missiles, and a fluidic capillary pyrometer for continuous temperature measurements in high-temperature process control.

GRA

N84-14466# AMAF Industries, Columbia, Md.
MAGNETIC FIELD COUPLED VELOCIMETERS Final Report, 1 Dec. 1981 - 30 Nov. 1982
Carl Spight 1983 63 p
(Contract F49620-82-C-0017; AF Proj. 2308)
(AD-A134002; Rept-8308-X4400-201; AFOSR-83-0856TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

The velocimeter R&D program entered a 'bench-top' scale experimental demonstration phase with the construction of a first prototype velocimeter drive-pickup coil array, a propane combustor test stand, and Z-80 based data acquisition/processing system. A computer code was written and successfully tested which modeled the response of the velocimeter array to flow field structures that could be realized on the test stand. Conventional diagnostics have been used to characterize the flow environment produced on the test stand. Preliminary testing of the velocimeter was begun at the end of the program year. Problems with signal detection and analysis were tentatively identified and possible solutions were under design. Author (GRA)

N84-14467# Massachusetts Inst. of Tech., Cambridge. Computational Fluid Dynamics Lab.
COMPUTATIONAL METHODS FOR COMPLEX FLOWFIELDS Annual Report, 1 Jun. 1982 - 31 May 1983
Earll M. Murman and Judson R. Baron 1 Jul. 1983 64 p
(Grant AF-AFOSR-0136-82; AF Proj. 2307)
(AD-A133970; AFOSR-83-0841TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The overall objective of this research is the development of solution algorithms for complex flowfields using procedures that take account of, recognize, and couple interacting subdomains. In Task I, non-adaptive embedded mesh solutions of the Euler equations have been obtained for NACA 0012, RAE 2822, and Korn 1 air foils. In Task II adaptive embedded mesh solutions have been obtained for one-dimensional flows with shock waves and a two-dimensional scalar convection-diffusion equation. GRA

N84-14468# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
RESEARCH ON NONSTEADY FLOW INDUCTION Annual Report, 1 Mar. 1982 - 23 Feb. 1983
Charles A. Garris and Joseph V. Foa 14 Jul. 1983 11 p
(Contract F49620-80-C-0043; AF Proj. 2307)
(AD-A133894; GWU-SEAS-TR-83-FI-3; AFOSR-83-0840TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A Flow Induction laboratory has been set up at The George Washington University for use in this project. Experimental work on the rotary jet and on the generation of rotary-jet pseudoblades through the utilization of propagating stall has produced encouraging performance results and useful new information. Additional observations have been made on the energetics of eddy formation. Improvements have been made in the design of rotary jets, and studies of further such improvements have been initiated.
Author (GRA)

N84-14469# Tel-Aviv Univ. (Israel).
ON THE RELATIONSHIP BETWEEN TRANSITIONAL AND FULLY TURBULENT SHEAR FLOW Final Report, 1 Mar. 1977 - 31 Mar. 1982
I. Wygnanski and S. Einav May 1982 156 p
(Grant AF-AFOSR-3275-77; AF Proj. 2307)
(AD-A133808; AFOSR-83-0806TR) Avail: NTIS HC A08/MF A01 CSCL 20/4

The possible relationship between the transitional spot and the large coherent structures in a fully-developed boundary layer was established. The final steps of transition and the generation of a turbulent boundary layer was simulated by generating a succession of spots and allowing them to interact in a controlled laboratory environment. Spots were also generated simultaneously at two points separated in the spanwise direction and their mode of interaction was observed. Measurements were made on a flat plate at a representative Reynolds number of 700,000 and using two types of rakes of hot wires. The data were processed digitally and the information gathered was used to assess the statistical methods commonly employed in gathering data in a boundary layer undergoing transition. It is established that ensemble averaged velocities do not represent the details of the flow adequately and ensemble averaged turbulent intensities may be physically deceiving. The interaction of spots generated in succession from a single point-source provides a reasonable simulation of the turbulent boundary layer. This mode of interaction inhibits the growth of individual spots in the streamwise and in the spanwise direction. As a result of this interaction the largest excursions of the UV product, representing the instantaneous shear stress occur near the leading interface of each spot. GRA

N84-14470# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
THE STRUCTURE OF THE INTERNAL WAVE MACH FRONT GENERATED BY A POINT SOURCE MOVING IN A STRATIFIED FLUID
E. P. Gray, R. W. Hart, and R. A. Farrell Sep. 1983 60 p
(Contract N00024-83-C-5301)
(AD-A133775; JHU/APL/TG-1334) Avail: NTIS HC A04/MF A01 CSCL 20/4

The height and velocity of an internal wave (IW) generated by a point fluid source moving horizontally in a stratified fluid have been calculated at asymptotically large distances behind the source. Particular emphasis has been given to the region near the Mach front, defined by the offtrack angle Theta M = sin-1 (cM/V), where cM is the speed of the fastest IW and V is the source velocity. To elucidate the asymptotic IW profile in that regime, a novel uniform asymptotic expansion was developed that is valid on both sides of the Mach front. It was found that the asymptotic approximation for the IW height, as well as for all its derivatives, is continuous at that front, and, furthermore, that all these IW profiles are remarkably smooth and slowly varying functions of offtrack distance in that regime. Author (GRA)

N84-14471# Flow Research, Inc., Kent, Wash.
EXPERIMENTAL STUDIES OF UNSTEADY PHENOMENA IN BOUNDARY LAYERS Annual Technical Report, 1 May 1982 - 30 Apr. 1983
Mohamed Gad-el-Hak May 1983 60 p
(Contract F49620-82-C-0020; AF Proj. 2307)
(AD-A133769; FRC-262; AFOSR-83-0869TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

The stability of decelerating boundary layer flow is investigated experimentally and numerically. Experimentally, a flat plate having a Blasius boundary layer is decelerated in an 18-m towing tank. The boundary layer becomes unstable to two-dimensional waves which break down into three-dimensional patterns, hairpin vortices, and finally turbulent bursts when the vortices lift off the wall. The unsteady boundary layer equations are solved numerically to generate instantaneous velocity profiles for a range of boundary and initial conditions. A quasi-steady approximation is invoked and the stability of local velocity profiles are determined by solving the Orr-Sommerfeld equation using Chebyshev matrix methods. Comparisons are made between the numerical predictions and the experimentally observed instabilities. Author (GRA)

N84-14472# Ballistic Research Labs., Aberdeen Proving Ground, Md.
LIQUID PAYLOAD ROLL MOMENT INDUCED BY A SPINNING AND CONING PROJECTILE Final Report
Charles H. Murphy Sep. 1983 53 p Supersedes ARBRL-IMR-771
(DA Proj. 1L1-61102-AH-43)
(AD-A133681; AD-F300322; ARBRL-TR-02521; ARBRL-IMR-771) Avail: NTIS HC A04/MF A01 CSCL 19/1

The linear theory for a coning and spinning liquid payload has been extended to the calculation of a quadratic roll moment. The resulting quadratic roll moment coefficient is shown to be exactly the negative of the linear side moment coefficient for constant amplitude coning motion. This relationship between side moment and roll moment has been observed for projectiles with moving solid components and has encouraging experimental support for liquid payloads. GRA

N84-14473# Wisconsin Univ., Madison. Mathematics Research Center.
SOME REMARKS ON THE CREEPING FLOW OF THE SECOND GRADE FLUID
K. R. Rajagopal (Pittsburgh Univ., Pa.) Aug. 1983 14 p
(Contract DAAG29-80-C-0041)
(AD-A132806; MRC-TSR-2548) Avail: NTIS HC A02/MF A01 CSCL 20/4

Tanner proved that the Stokes flow solution for the plane flow of the Newtonian fluid is also a solution for the steady plane creeping flow of an incompressible homogeneous fluid of second grade. This paper investigates sufficient conditions under which the above theorem can be extended to three dimensional flows. Also investigated are certain related questions. Author (GRA)

N84-14474# Massachusetts Inst. of Tech., Cambridge. Acoustics and Vibration Lab.
THE RESPONSE OF A LAMINAR BOUNDARY LAYER TO SOUND AND WALL VIBRATION
Charles J. Gedney May 1983 189 p
(Contract N00014-76-C-0396)
(AD-A132843; A/V-83560-3) Avail: NTIS HC A09/MF A01 CSCL 20/4

An experimental analysis of the interaction of sound and plate vibration with a laminar boundary layer is presented. The two excitations generate disturbances at the leading edge of the plate which develop into Tollmien-Schlichting (TS) waves in the quasi-parallel region of the boundary layer. It is demonstrated that the TS wave and the sound wave coexist independently in this region, as predicted by the linear theory. A TS wave generated by a vibrating ribbon is shown to superimpose linearly with the sound-generated TS wave. Plate vibration is used to successfully cancel a sound-excited TS wave. GRA

N84-14475# California Univ., Berkeley. Dept. of Mechanical Engineering.
TURBULENT FLOW IN PASSAGE AROUND A 180 DEG BEND; AN EXPERIMENTAL AND NUMERICAL STUDY Final Annual Report, 1 Oct. 1982 - 30 Sep. 1983
Joseph A. C. Humphrey Sep. 1983 166 p
(Contract N00014-80-C-0031)
(AD-A132845; UCB/FM-83-7) Avail: NTIS HC A08/MF A01 CSCL 20/4

Laser Doppler velocimeter measurements for turbulent flow in a 180 degree bend of square cross-section are presented and discussed. These reveal previously undocumented anisotropic features in the flow. Limited data are also provided for the flow in the downstream tangent. Numerical predictions of the flow configurations were made with two types of turbulence models. The two-equation model yields results in broad agreement with the data but fails to reproduce detailed variations present in the flow. It is shown that while the algebraic stress model can resolve these variations, good spatial resolution of the mean flow field is required. GRA

N84-14476# Wisconsin Univ., Madison. Mathematics Research Center.
ON A VISCOMETRIC FLOW OF A SIMPLE FLUID
K. R. Rajagopal Aug. 1983 15 p
(Contract DAAG29-80-C-0041)
(AD-A132852; MRC-TSR-2547) Avail: NTIS HC A02/MF A01 CSCL 20/4

A class of globally viscometric flows which has relevance to slow flows occurring between two infinite parallel plates rotating with differing angular velocities about a common axis, is studied. Author (GRA)

N84-14477# Mississippi Univ., University. Physical Acoustics Research Group.
AN ACOUSTIC LEVITATION TECHNIQUE FOR THE STUDY OF NONLINEAR OSCILLATIONS OF GAS BUBBLES IN LIQUIDS
D. A. Young and Lawrence A. Crum 15 Aug. 1983 74 p
(Contract N00014-81-K-0691)
(AD-A132858; PARGUM-2-83) Avail: NTIS HC A04/MF A01 CSCL 20/4

A technique of acoustic levitation was developed for the study of individual gas bubbles in a liquid. Isopropyl alcohol and a mixture of glycerine and water (33-1/3% glycerine by volume) were the two liquids used in this research. Bubbles were levitated near the acoustic pressure antinode of an acoustic wave in the range of 20-22 kHz. Measurements were made of the levitation number as a function of the normalized radius of the bubbles. The levitation number is the ratio of the hydrostatic pressure gradient to the acoustic pressure gradient. These values were then compared to a nonlinear theory. Results were very much in agreement except for the region near the n=2 harmonic. An explanation for the discrepancy between theory and experiment appears to lie in the polytropic exponent associated with the gas in the interior of the bubble. Author (GRA)

N84-14478# Wisconsin Univ., Madison. Mathematics Research Center.
THE INTERFACES OF ONE-DIMENSIONAL FLOWS IN POROUS MEDIA
Juan L. Vazquez Jul. 1983 38 p
(Contract DAAG29-80-C-0041)
(AD-A132862; MRC-TSR-2538) Avail: NTIS HC A03/MF A01 CSCL 12/1

A porous media equation (PME) has been used as a model for a number of physical phenomena: heat diffusion at high temperatures, boundary layer theory, spread of a thin layer of viscous material and mainly the flow of gas in a porous medium. The most distinctive characteristic of the solutions to (PME) as compared with the linear heat equation is the finite speed of propagation. In this paper the properties of the interfaces are studied in terms of the initial data. Sometimes the interface is stationary for a certain time and then begins to move: we characterize the existence of a positive waiting time and give bounds for it. GRA

N84-14479# Naval Civil Engineering Lab., Port Hueneme, Calif.
FLUIDIZED BED AIR-TO-AIR HEAT PUMP EVAPORATOR EVALUATION Final Report, Oct. 1982 - Sep. 1983
Joseph L. Ashley Jul. 1983 5023 p
(F66512)
(AD-A133072; NCEL-TN-1673) Avail: NTIS HC A02/MF A01 CSCL 13/1

Frost formation of air-to-air heat pump evaporator surfaces reduces unit efficiency and restricts application. The use of a fluidized bed heat exchanger as an air-to-heat pump evaporator was investigated to determine if frost accumulation could be eliminated. Experimental investigations were conducted and the following results obtained: (1) frost accumulation was insignificant with fluidized bed temperatures below 32 F and (2) moisture accumulation from condensation resulted in unstable fluidized bed operation when the fluidized bed temperature was above 32 F. Several concepts - maintenance bed temperature below 32 F, reverse refrigerant flow, air-dry bed, nonadhering bed material, and ultrasonics - to solve the moist bed problem were evaluated, with no practical solution being developed. The use of a fluidized bed heat exchanger for air-to-air heat pump evaporators was determined not feasible. Author (GRA)

N84-14480# Bosch (Robert) G.m.b.H., Stuttgart (West Germany). Technisches Zentrum Forschung.
CENTRAL HEAT PUMP UNITS: PROBLEMS OF HEAT OUTPUT CONTROL Final Report, Dec. 1981
Wilhelm Amrhein, Walte Daniel, and Willi Kragl Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 103 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-159; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West

Germany DM 21,50

Methods of regulating the output of heat pumps, other than on-off controls are investigated. Speed variation of drive motor; modification of compressor constructional design; and varying the number of compressors were tested. Results suggest the best energy savings are achieved by step-by-step variation of the coolant mass flow, by parallel connection of compressors or by varying the speed with a drive motor with changeable poles. Author (ESA)

N84-14481# Karlsruhe Univ. (West Germany). Ausbreitungs- und Transportvorgaence in Stroenungen.
EULERIAN AND LAGRANGIAN PREDICTIONS OF PARTICULATE TWO PHASE FLOWS
F. Durst (Erlangen-Nuerenberg Univ., West Germany), D. Milojevic (Boris Kidric Inst. of Nuclear Sciences, Belgrad), and B. Schoenung Apr. 1983 60 p refs
(KU-SFB-80/T/222) Avail: NTIS HC A04/MF A01

Computer codes for Eulerian and Lagrangian approaches to two phase particulate flows were tested in vertical pipe flow at various particle concentrations, and for sudden expansion in a vertical pipe flow. Results show that the Lagrangian approach has advantages for predicting flows in which large particle accelerations occur. It handles particulate two phase flows consisting of polydispersed particle size distributions simply. The Eulerian approach has advantages in all flow cases where high particle concentrations occur and where the high void fraction of the flow becomes a dominating flow controlling parameter.
Author (ESA)

N84-14482# Pittsburgh Univ., Pa. Dept. of Chemical and Petroleum Engineering.
HEAT AND MASS TRANSFER DURING THE GROWTH AND DISSOCIATION OF GAS HYDRATES IN POROUS MEDIA Annual Report, Mar. 1982 - Mar. 1983
G. D. Holder and V. A. Kamath Apr. 1983 70 p refs
(PB83-255414; GRI-81/0168) Avail: NTIS HC A04/MF A01 CSCL 07D

An experimental technique forming cores of methane and propane hydrate was developed. This technique involves the conversion of a compacted zone of ice frost to hydrates by pressurization with methane at temperatures slightly above the ice point. The cores so formed can be used for studying phenomena associated with the breakdown (dissociation) of hydrates in the Earth. It was found that the heat transfer coefficients between the hydrate and warm water varies between 400 and 1800 kcal/sq m-HR-degree C. The dissociation rate of methane hydrates is two to three times that of propane hydrates, but the heat transfer rates in case of methane are lower by about factor of 1.5 than that in case of propane hydrates. GRA

N84-14483# Environmental Design and Planning, Inc., Boston, Mass.
VALUE OF FLOW CALIBRATION FOR DECISION MAKING IN INFILTRATION/INFLOW STUDIES
William C. Pisano, David S. Watson, and Gerald L. Aronson Sep. 1983 75 p refs
(Grant EPA-R-804578)
(PB83-259739; EPA-600/2-83-087) Avail: NTIS HC A04/MF A01 CSCL 13B

The value of flow calibration for decision making in sewer system studies is studied. Primary data used were the field measurement results from a prior infiltration/inflow study conducted for the Metropolitan District Commission, Boston, covering portions of West Roxbury-Newton-Brookline-Dedham in the Boston metropolitan area. The results are applicable for any sewer system flow measurement program. Included were a variety of what if scenarios for critical key manholes as to the amount of information available to develop stage/flow calibration curves. The findings indicate that the additional care and the costs involved in primary flow calibration of stage/flow curves for sewer system evaluations are well worth the effort, and, in many instances, could save the government valuable resources. Author (GRA)

N84-14484# National Bureau of Standards, Washington, D.C.
PREDICTION OF FLOATING SOLID VELOCITIES IN UNSTEADY PARTIALLY FILLED PIPE FLOW
John A. Swaffield Jul. 1983 37 p refs Sponsored in part by HUD
(PB83-259598; NBSIR-82-2614) Avail: NTIS HC A03/MF A01 CSCL 13B

The method of characteristics is applied to solve the unsteady partially filled pipe flow equations and to predict the velocity of floating solids assumed to travel at a fixed percentage of the local flow velocity. Experimental verification for the technique is provided for cylindrical solids in 100 mm diameter drainage pipe at a range of gradients from 1/40 to 1/150. The system upstream boundary conditions are shown to be capable of representation in terms of the inflow energy at the pipe entry section. Steady flow floating solid to flow velocity ratios are presented at 1/150 pipe gradient and further areas of experimental work to determine the variation of these ratios with pipe gradient and flow depth are identified. Author (GRA)

N84-14485 Texas Univ., Austin.
A FINITE ELEMENT ANALYSIS OF INCOMPRESSIBLE LAMINAR AND TURBULENT FLOW WITH HEAT TRANSFER PAST IRREGULAR SURFACES Ph.D. Thesis
Gary Frank Polansky 1983 131 p
Avail: Univ. Microfilms Order No. DA8319663

The finite element method was investigated as a means of simulating flows past discrete roughness elements. Governing equations include the complete, planar Navier-Stokes equations written in terms of primitive variables; the penalty function technique was used to satisfy the incompressibility constraint. Good results were obtained for a number of laminar flows in geometries which produce recirculating regions. It was also demonstrated that oscillating solutions may be avoided through the use of judicious mesh distributions, without the use of upwind differencing, excessive mesh refinement, or special corner boundary conditions. The formulation was then expanded to include a two-equation model of turbulence transport (based on turbulence kinetic energy and turbulence dissipation rate) and the turbulent energy equation. Based on the study of fully developed channel flow it was found that the high Reynolds number form of the two-equation model was incompatible with the current information. Dissert. Abstr.

N84-14486 Colorado Univ., Boulder.
BUCKLING FLOW AND TRANSITION TO TURBULENCE IN AXISYMMETRIC PLUMES Ph.D. Thesis
Shigeo Kimura 1983 106 p
Avail: Univ. Microfilms Order No. DA8317675

The first part of this thesis reports a model and experiment study of the fundamental mechanism responsible for transition in natural convection plume flow. The model shows that the transition occurs when the time of viscous penetration to the plume becomes comparable with the time period with which the plume can fluctuate as an unstable inviscid stream. The experimental part of the study focused on transition in an axisymmetric air plume above a point heat source. Smoke visualization of the plume shape at transition led to extensive observations that strongly support the transition mechanism proposed by our model. The transitional plume is seen to meander in a plane (two dimensional) and with a wavelength which scales with the plume diameter. The second part of the thesis documents the sinuous flow of a vertical water column (a sinking plume) which impinges on a horizontal surface.
Dissert. Abstr.

N84-14487 Colorado State Univ., Fort Collins.
HEAT TRANSFER, PRESSURE DROP, AND FLUID FLOW IN INTERRUPTED WALL PASSAGES Ph.D. Thesis
Ronald S. Mullisen 1983 173 p
Avail: Univ. Microfilms Order No. DA8317816

Experiments were performed to obtain heat transfer, pressure drop, and fluid flow information in interrupted wall passages formed from multiple arrays of parallel, in-line, and staggered plate arrangements and one cross-plate arrangement. The experiments included parametrically adjusting plate thickness, plate length, streamwise spacing between plate arrays and Reynolds number. The results show that the shorter the plate length, the greater the heat transfer augmentation. Also, heat transfer increased with plate thickness, but with a relatively larger penalty in pressure drop. Using the Schlieren method for flow visualization, three flow regions were identified and found to be correlated to the heat transfer and pressure drop data. In one of the flow regions, periodic vortex shedding produced audible tones. However, significant heat transfer augmentation may be realized without venturing into this region. Dissert. Abstr.

N84-14488 Colorado Univ., Boulder.
BUCKLING OF TURBULENT JETS Ph.D. Thesis
Ren Scott Anderson 1983 91 p
Avail: Univ. Microfilms Order No. DA8317637

The stability of round turbulent jets is examined for two different cases. The first case concerns the static buckling of a downward-flowing jet confined by a flexible duct. The equilibrium shape of the duct is found to be approximately sinusoidal with a wavelength which is inversely proportional to both flow velocity and distance from the fixed end of the duct. The amplitude of the buckled shape is found to be governed by the magnitude of the shear stress caused by slight deflection of the fluid stream as it leaves the free end of the duct. Experimental measurements confirm the buckling wavelength predicted analytically. The second case considered in the present study is that of a free jet surrounded by an annular shear layer. The mean jet velocity profile is assumed to be a curvilinear trapezoid which approximates the mean profile in the developing region of round turbulent jets. The radial dependence of the amplitudes of growing disturbances are examined in order to illustrate the extent to which the disturbance penetrates into the jet. Dissert. Abstr.

N84-14489 Georgia Inst. of Tech., Atlanta.
CONTINUOUSLY DEFORMING FINITE ELEMENT METHOD FOR MOVING FREE SURFACE HEAT TRANSFER PROBLEMS Ph.D. Thesis
Chung-Whee Kim 1983 177 p
Avail: Univ. Microfilms Order No. DA8315356

A two dimensional transient analysis of forced convection heat transfer for a heated liquid with a free surface advancing into an initially empty channel of finite length at a lower temperature is examined. The analysis includes the solid-liquid interface condition as a part of the "conjugate" problem solution. The solution is obtained by developing a new finite element computational methodology. Initially, a fictitious finite element layer method to analyze transient thermal contact problems is developed and applied to the one dimensional thermal contact problem. It is shown to be superior to the conventional finite element approach without compromising the computational economy. The method is successfully extended to the two dimensional thermal contact problem associated with transient forced convention heat transfer in a channel. These results are examined in terms of the method of vectorial dimensional analysis. Dissert. Abstr.

N84-14490 Cincinnati Univ., Ohio.
GLOBAL PRESSURE RELAXATION PROCEDURE FOR LAMINAR AND TURBULENT INCOMPRESSIBLE FLOWS WITH STRONG INTERACTION AND SEPARATION Ph.D. Thesis
Dhanireddy Ramalinga Reddy 1983 215 p
Avail: Univ. Microfilms Order No. DA831356

A global pressure relaxation formulation for the reduced form of the Navier-Stokes equations, frequently referred to as semi-elliptic or partially parabolized or just "parabolized" Navier-Stokes (PNS) equations is presented. Unlike the conventional methods used for the numerical solution of the primitive (u,v,p) form of the (elliptic) Navier-Stokes equations where the velocity components are determined from the momentum equations and the pressure is obtained from the differential poisson equation derived from the momentum equations, the PNS formulation closely follows the asymptotic theories for the evaluation of viscous interacting flows at large Reynolds numbers. The continuity equation is satisfied exactly at each grid point and a poisson pressure equation is not required explicitly. This formulation requires only pressure to be stored during the relaxation process for non-separated flows and for separated flows velocities are required only in the regions of reversed flows. Dissert. Abstr.

N84-14205# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
THE ROLE OF MOMENTUM TRANSFER TO THE AMBIENT PLASMA IN CRITICAL VELOCITY EXPERIMENTS
Gerhard Haerendel *In* ESA Active Expts. in Space Jul. 1983 p 245-247 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-14491* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SELF-CORRECTING ELECTRONICALLY SCANNED PRESSURE SENSOR Patent
Chris Gross, inventor (to NASA) Issued 16 Aug. 1983 7 p Filed 31 Mar. 1981 Supersedes N81-27121 (19 - 18, p 2437)
(NASA-Case-LAR-12686-1; US-Patent-4,399,515;
US-Patent-Appl-SN-249304; US-Patent-Class-364-571;
US-Patent-Class-364-557; US-Patent-Class-364-558;
US-Patent-Class-73-714) Avail: US Patent and Trademark Office CSCL 14B

A multiple channel high data rate pressure sensing device is disclosed for use in wind tunnels, spacecraft, airborne, process control, automotive, etc., pressure measurements. Data rates in excess of 100,000 measurements per second are offered with inaccuracies from temperature shifts less than 0.25% (nominal) of full scale over a temperature span of 55 C. The device consists of thirty-two solid state sensors, signal multiplexing electronics to electronically address each sensor, and digital electronic circuitry to automatically correct the inherent thermal shift errors of the pressure sensors and their associated electronics.
Official Gazette of the U.S. Patent and Trademark Offices

N84-14492 Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
CONTROL OF THE HP3325 FREQUENCY SYNTHESIZER BY A PDP 11 COMPUTER FOR GRAVITATIONAL EXPERIMENTS [CONTROLLO DEI SINTETIZZATORI DI FREQUENZA HP 3325A MEDIANTE ELABORATORE PDP 11 PER L'ESPERIMENTO GRAVITAZIONALE]
M. Pappagallo and G. Vannaroni Sep. 1983 32 p refs In ITALIAN
(IFSI-83-9) Avail: NTIS HC A03

The digital interface for the control of the frequency synthesizer is described. The system is composed of a room temperature 2500 kg gravitational antenna, a transducer with a low noise amplifier coupled to two phase sensitive detectors controlled by reference signals from a high stability oscillator (frequency synthesizer) working at the exact resonant frequency of the antenna. The temperature variations change the resonant frequency of the resonant modes of the antenna, requiring an automatic control of the reference signals. The electrical schema of the synthesizer command module which interfaces the PDP11 computer to a maximum of 8 HP3325A synthesizers is given. The program for the management of the interface is described.
Author (ESA)

N84-14493# Materials Research Labs., Melbourne (Australia).
MEASUREMENT OF VELOCITY AND DISPLACEMENT OF A TRANSVARESTRAINT TESTING MACHINE
N. J. Baldwin and B. F. Dixon May 1983 17 p refs
(MRL-TN-473; AR-003-296) Avail: NTIS HC A02/MF A01

A transvarestraint testing machine has been instrumented to determine the accuracy of the existing displacement measuring system and to determine the velocity characteristics under test conditions. Measurements of displacement and velocity were achieved and recommendations for machine and instrumentation improvements have been made. Author

N84-14494# California Univ., Los Angeles.
ADAPTIVE NOISE CANCELLATION IN NEUROMAGNETIC MEASUREMENT SYSTEMS
J. S. Hansen (APL, Laurel, Md.), D. Bowser (APL, Laurel, Md.), H. Ko (APL, Laurel, Md.), F. Richer, Jackson Beatty, and D. Brenner (Rockwell International Corp., Anaheim, Calif.) Apr. 1983 14 p Repr. from Il Nuovo Cimento (Italy), v. 2D, no. 2, Mar. - Apr. 1983 p 203-213 Presented at the 4th Intern. Workshop on Biomagnetism, Rome, 14-16 Sep. 1982
(Contract N00014-76-C-0616; NR Proj. 201-207)
(AD-A132547; TR-31) Avail: NTIS HC A02/MF A01 CSCL 06/16

The noise spectrum of a superconducting second derivative gradiometer was investigated. Data were acquired three orthogonal accelerometers and a triaxial fluxgate magnetometer attached to the dewar. An adaptive noise canceller was used to reduce noise in the gradiometer data. Results indicate that the environmental noise and dewar motion noise can be reduced as much as 40 dB in noise power. M.G.

N84-14495# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
THE JILA (JOINT INSTITUTE FOR LABORATORY ASTROPHYSICS) PORTABLE ABSOLUTE GRAVITY APPARATUS
J. E. Faller, Y. G. Guo (National Inst. of Metrology, Peking, China), J. Gschwind (Defense Mapping Agency, Cheyenne, Wyo.), T. M. Niebauer, R. L. Rinker, and J. Xue Aug. 1983 24 p
(AD-A132199; AD-E750839) Avail: NTIS HC A02/MF A01 CSCL 08/5

We have developed a new and highly portable absolute gravity apparatus based on the principles of free-fall laser interferometry. A primary concern over the past several years has been the detection, understanding, and elimination of systematic errors. In the Spring of 1982, we used this instrument to carry out a survey at twelve sites in the United States. Over a period of eight weeks, the instrument was driven a distance of nearly 20,000 km to sites in California, New Mexico, Colorado, Wyoming, Maryland, and Massachusetts. The time required to carry out a measurement at each location was typically one day. Over the next several years, our intention is to see absolute gravity measurements become both usable and used in the field. To this end, and in the context of cooperative research programs with a number of scientific institutes throughout the world, we are building additional instruments (incorporating further refinements) which are to be used for geodetic, geophysical, geological, and tectonic studies. With these new instruments we expect to improve (perhaps by a factor of two) on the 6-10 microgal accuracy of our present instrument. Today, one can make absolutely gravity measurements as accurately as - possibly even more accurately than - one can make relative measurements. Given reasonable success with the new instruments in the field, the last years of this century should see absolute gravity measurement mature both as a new geodetic data type and as a useful geophysical tool. GRA

N84-14496# International Business Machines Corp., San Jose, Calif.
OPTICAL PROBING OF PHOTOACOUSTIC PROPAGATION FOR NONCONTACT MEASUREMENT OF FLOWS, TEMPERATURES AND CHEMICAL COMPOSITIONS
A. C. Tam, W. Zapka, H. Coufal, and B. Sullivan 21 Oct. 1983 12 p Submitted for publication
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A134129; TR-3) Avail: NTIS HC A02/MF A01 CSCL 14/2

Noncontact techniques of optical probing of photoacoustic pulses provide new opportunities for ultrasonic and/or spectroscopic measurement in hostile environments (e.g., flames, corrosive fluids, dangerous aerosols, etc.) and also basic understanding of photoacoustic generation processes. This paper provides examples of such applications in the new field of 'optical ultrasonics' (whereby ultrasonic determinations of flows, temperatures, etc., are measured optically), including 'optical ultrasonic spectroscopy' (whereby ultrasonic dispersion and relaxations are measured optically). GRA

N84-14497# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
SOLAR RADIATION TESTS Final Report
21 Sep. 1983 19 p
(AD-A133889; ITOP-4-2-826) Avail: NTIS HC A02/MF A01 CSCL 14/2

Tests to determine the effects of solar radiation and high air temperature on military equipment with regard to material damage and operational capabilities are described. a procedure for establishing a solar radiation-equivalent high temperature for use in environmental chamber tests is included. M.G.

N84-14498# Delta Information Systems, Inc., Jenkintown, Pa.
USERS MANUAL FOR NCS (NATIONAL COMMUNICATIONS SYSTEM) FACSIMILE TEST DOCUMENT TAPES. ADDENDUM Final Report
Richard A. Schaphorst and Steve Urban Jul. 1983 54 p
(Contract DCA100-80-C-0042)
(AD-A133830; NCS-TIB-83-5) Avail: NTIS HC A04/MF A01 CSCL 14/3

Under a Contract, Delta Information Systems scanned four test documents at five resolutions and stored the resultant data on magnetic tape. Two sets of tape were generated - a one bit set and an 8 bit set. In the 1 bit set, each picture element is binary. In the 8 bit set, each picture element can have 256 possible gray shades. This report is an addendum to the previously delivered users manual. The purpose of this project is to print out the forty images on tape to verify their visual characteristics. In the case of the one bit/pel image the objective is to insure that all extraneous pels have indeed been removed. In the cases of the eight bit/pel image the purpose is to determine the general nature of the extraneous pels. All images were printed on a Versatec V-80 plotter capable of printing only black or white pels and having a resolution of 200 pels/inch. In the case of the 8 bit/pel images only the most significant bit of the 8 bits was printed. GRA

N84-14499# Honeywell Corporate Technology Center, Bloomingdale, Minn.
E-BEAM WRITTEN COMPUTER GENERATED HOLOGRAMS Final Technical Report, 1 Jan. 1980 - 28 Feb. 1983
Steven M. Arnold Aug. 1983 87 p
(Contract F49620-80-C-0029; AF Proj. 2305)
(AD-A133772; E47069; AFOSR-83-0850TR) Avail: NTIS HC A05/MF A01 CSCL 14/5

This final report describes a three-year research program to investigate computer generated holograms produced by electron beam lithography. Because they are light weight and can create wavefronts of arbitrary complexity, computer generated holograms are attractive for applications such as optical data processing and optical testing. To be practical, these elements must have large space-bandwidth products, and have the qualities of high diffraction efficiency, low scattering, low aberration and low cost, as compared to conventional optics. Developed have been generalized encoding algorithms and fabrication techniques for producing e-beam computer generated holograms having submicron feature sizes, distortion-free resolution of better than 0.4 micron, and space-bandwidth products in excess of 10 to the 7th power. E-beam lithography is superior to optical plotting for writing computer generated holograms and, with further refinement, could be extended to produce holograms having space-bandwidth products as large as 10 to the 11th power, comparing favorably with interferometrically recorded holograms. GRA

N84-14500# Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE MEASUREMENT OF LARGE STRAINS WITH FOIL RESISTANCE STRAIN GAGES

Robert E. Franz Aug. 1983 41 p
(AD-A133687; AD-F300318; ARBRL-TR-02519) Avail: NTIS HC A03/MF A01 CSCL 11/6

Gas factor changes in foil resistance strain gages were observed and measured. Errors due to these changes are discussed and corrections for the gages studied were determined. Residual volume changes during plastic deformation in 7039 Aluminum Alloy and S-7 tool steel were shown to be small and unmeasurable with the gages used. The gage factor changes were assumed to be the result of plastic work in the gage material. Estimates of the magnitude of the resistance changes due to plastic deformation in constant and were made using tension experiments on wires. GRA

N84-14501# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

FAST OPTICAL POSITION-SENSITIVE DETECTOR FOR MCPHERSON ESCA-36

Patricia A. Bertrand, Walbert J. Kalinowski, Lewis E. Tribble, and Lucio U. Tolentino 1 Jun. 1983 18 p
(Contract F04701-82-C-0083)
(AD-A132606; TR-0083(3945-06)-3; SD-TR-83-40) Avail: NTIS HC A02/MF A01 CSCL 14/2

An optical position-sensitive detection system was added to a McPherson ESCA-36 X-ray photoelectron spectrometer. The system contains a multichannel electron multiplier and vidicon TV camera and operates 250 times faster than the original single-channel electron multiplier. Author (GRA)

N84-14502# Brookhaven National Lab., Upton, N. Y.

INVESTIGATION ON LOW PRESSURE LIMIT OF BAYARD-ALPERT GAUGE

T. S. Chou, C. Lanni, and Z. Q. Tang 1983 20 p refs Presented at the Am. Vacuum Soc. Meeting, Boston, 1-4 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002578; BNL-33743; CONF-831171-9) Avail: NTIS HC A02/MF A01

To extend the pressure measurement of devices used in most UHV applications to the lowest limit possible, several commercial Bayard-Alpert gauges were modified. A hairpin flament, used in this experiment for its accuracy in positioning the filament to improve the gauge performance. The quantities of the normal and reverse X-ray photo current and possibility of self modulation are presented. The potential of this gauge to measure pressures down to 10(+13) Torr range with lower emission current is strongly indicated. DOE

N84-14503# Oak Ridge National Lab., Tenn.

APPARENT THERMAL CONDUCTIVITY MEASUREMENTS BY AN UNGUARDED TECHNIQUE

R. S. Graves, D. W. Yarbrough, and D. L. McElroy 1983 26 p refs Presented at 18th Intern. Thermal Conductivity Conf., Rapid City, S.D., 3 Oct. 1983
(Contract W-7405-eng-26)
(DE84-001964; CONF-8310163-4) Avail: NTIS HC A03/MF A01

An unguarded longitudinal heat flow apparatus for measuring the apparent thermal conductivity (lambda/sub a) of insulations was tested. Heat flow is provided by a horizontal electrically heated Nichrome screen sandwiched between test samples that are bounded by temperature controlled copper plates and 9 cm of mineral fiber insulation. A determinate error analysis shows lambda/sub a/ measurement uncertainty to be less than + or - 1.7% for insulating materials as thin as 3 cm. Three-dimensional thermal modeling indicates negligible error in lambda/sub a/ due to edge loss for insulations up to 7.62 cm thick when the temperature difference across the sample is measured at the screen center. System repeatability and reproducibility were determined to be + or - 0.2%. Differences of lambda/sub a/ results from the screen tester and results from the National Bureau of Standards were 0.1% for a 10-kg/m(3) Calibration Transfer Standard and 0.9% for 127-kg/m(3) fibrous glass board (SRM 1450b). Measurements on fiberglass and rock wool batt insulations showed the dependence of lambda/sub a/ on density, temperature, temperature difference, plate emittance, and heat flow direction. Results obtained for lambda/sub a/ as a function of density at 240C differed by less than 2% from values obtained with a guarded hot plate. It is demonstrated that this simple technique has the accuracy and sensitivity needed for useful lambda/sub a/ measurements on thermal insulating materials. DOE

N84-14504# Hanford Engineering Development Lab., Richland, Wash.

IMAGING OF FAST-NEUTRON SOURCES USING SOLID-STATE TRACK-RECORDER PINHOLE RADIOGRAPHY

F. H. Ruddy, R. Gold, J. H. Roberts, B. J. Kaiser, and C. C. Preston Aug. 1983 6 p refs Presented at the 12th Intern. Conf. on Solid State Nucl. Track Detectors, Acapulco, Mexico, 4-10 Sep. 1983
(DE84-001466; HEDL-SA-2859-FP; CONF-830969-3) Avail: NTIS HC A02/MF A01

Pinhole imaging methods were tested for potential future use in imaging the intense neutron source of the fusion materials irradiation test (FMIT) facility. Calibration measurements of the proton, neutron, and alpha particle response characteristics of CR-39 polymer solid state track reorders (SSTRs) are used to interpret the results of imaging experiments using both charged particle and neutron pinhole collimators. High resolution, neutron pinhole images of a (252) Cf source were obtained in the form of neutron induced proton recoil tracks in CR-39 polymer SSTR. The imaging experiments and their potential future applications to FMIT are described. DOE

N84-14505# Brookhaven National Lab., Upton, N. Y.

FOCUSING X-RAY MONOCHROMATOR FOR EXAFS STUDIES IN THE ENERGY RANGE 4-30 keV

Steve M. Heald 1983 13 p refs Presented at the 3rd Natl. Conf. on Symchronotron Radiation Instr., Upton, N.Y., 12 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-001903; BNL-33724; CONF-830910-4) Avail: NTIS HC A02/MF A01

The design and operating principles of a focusing X-ray monochromator are described. Consistent with extended X-ray absorption fine structure (EXAFS) applications it allows rapid tuning while maintaining high energy resolution and a fixed focus at the sample. The basic instrument consists of two opposing two crystal monochromators with the second and third crystals operating as a dispersive monochromator. This provides the intrinsic resolution of the crystals independent of silt settins or source size effects. To maintain a fixed focus two options are available: (1) the second crystal pair is translated while the radius of the fourth crystal is held fixed; (2) the radius of the bent crystal is changed dynamically as the scan is carried out. These techniques are compared and a crystal ender designed for rapid tuning is described. DOE

N84-14506# Los Alamos Scientific Lab., N. Mex.

NEW-GENERATION LOW-POWER RADIATION SURVEY INSTRUMENTS

D. A. Waechter, G. O. Bjarke, M. A. Wolf, F. Trujillo, and C. J. Umbarger 1983 5 p Presented at the IEEE Nucl. Sci. Symp., San Francisco, 19-21 Oct. 1983
(Contract W-7405-eng-36)
(DE84-001716; LA-UR-83-2942; CONF-831015-5) Avail: NTIS HC A02/MF A01

Ultra low powered radiation instruments were developed. Two instruments which use a novel power source to eliminate costly batteries are discussed. The gamma detecting radiac the firefly, and the alpha particle detecting instrument, the simple cordless alpha monitor, both use recent advances in miniaturization and power saving electronics to yield devices which are small, rugged, and very power frugal. The two instruments consume so little power that the need for batteries to run them is eliminated. They are powered by a charged capacitor which will operate the instruments for an hour or more. Both line power and mechanical sources are used to charge the storage capacitors which power the instruments. DOE

N84-14507# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.

DESCRIPTION OF A CALIBRATOR FOR PIEZOELECTRIC PRESSURE TRANSDUCERS

Tage Eriksson 18 May 1983 17 p ref In SWEDISH; ENGLISH summary
(FOA-C-20496-D4; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

A compressed air calibrator for pressure transducers is described. The maximum pressure is 10 MPa and the risetime of the pulse is 30 msec. The calibrator is portable and comprises and aluminum air bottle, four precision manometers (measuring ranges 0.25 MPa, 1 MPa, 2,5 MPa and 10 MPa), pressure reducer fitted with manometers (inlet), pressure adjusting valve to air bottle and spherical valve (outlet) fitted with holders for the pressure transducers. Author (ESA)

N84-14508# Istituto Nazionale di Fisica Nucleare, Trieste (Italy).

SIMPLIFIED ANALYSIS OF A CAPACITIVE RESONANT TRANSDUCER WITH A SQUID AMPLIFIER [ANALISI SEMPLIVICATA DI UN TRASDUTTORE SPACITIVO RISONANTE CON AMPLIFICATORE SQUID]

G. V. Pallottino Apr. 1983 74 p refs In ITALIAN
(IFSI-83-4) Avail: NTIS HC A04/MF A01

A system comprising two mechanical oscillators, a gravitational antenna and the transducer, a polarization circuit, and an electrical oscillator formed by the capacity of the circuit and the inductance of the SQUID was analyzed. Only one of the two modes of the mechanical resonant system was considered; the interaction between the choosen mechanical mode and the electrical mode was ignored. The effective temperature of the detection system was sought as a function of system parameters. The fifth order model was studied with numerical methods obtaining analytical expressions for the effective temperature of the detection system. The computed results are presented for several values of the main system parameters. Author (ESA)

N84-14570* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE HCMM SYSTEM: DEVELOPMENT AND PERFORMANCE

Locke M. Stuart, Jr. *In its* The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 245-260 Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-14509* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LASER RESONATOR Patent

Lawrence L. Harper, inventor (to NASA) (International Laser Systems, Inc., Orlando, Fla.) Issued 13 Dec. 1983 10 p Filed 5 Jun. 1981 Supersedes N82-24485 (20 - 15, p 2088)
(NASA-Case-GSC-12565-1; US-Patent-4,420,836;
US-Patent-Appl-SN-270763; US-Patent-Class-372-98;
US-Patent-Class-372-100; US-Patent-Class-372-108;
US-Patent-Class-372-93; US-Patent-Class-372-94;
US-Patent-Class-350-299; US-Patent-Class-356-345) Avail: US Patent and Trademark Office CSCL 20E

An optical resonator cavity configuration has a unitary mirror with oppositely directed convex and concave reflective surfaces disposed into one fold and concertedly reversing both ends of a beam propagating from a laser rod disposed between two total internal reflection prisms. The optical components are rigidly positioned with perpendicularly crossed virtual rooflines by a compact optical bed. The rooflines of the internal reflection prisms, are arranged perpendicularly to the axis of the laser beam and to the optical axes of the optical resonator components.

Official Gazette of the U.S. Patent and Trademark Office

N84-14510# International Business Machines Corp., San Jose, Calif.

PROFILE OF LASER-PRODUCED ACOUSTIC PULSE IN A LIQUID

A. C. Tam and B. Sullivan 12 Oct. 1983 26 p Submitted for publication
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A134138; TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/1

Recently, Lai and Young have independently calculated the profile of a thermo-elastically generated opto-acoustic pulse due to the passage of an excitation laser pulse of certain spatial and temporal intensity distributions in a weakly absorbing medium. The authors of this document have found that Lai's Young's results are essentially equivalent for Gaussian intensity distribution of the excitation laser. The authors report the first experimental verification of such theoretical opto-acoustic profiles excited by laser pulses of various pulse widths tau FWHM (8 nsec and 1.3 microsecs) focussed to different beam waists w sub o. Observation of the profile is performed with a probe beam deflection technique instead of using conventional acoustic transducers which have limited risetimes and nonflat frequency response. The author's are in reasonable agreement with theory, and clearly indicate that sharp opto-acoustic pulses can be generated by laser pulses of short tau FWHM and small w sub o. GRA

N84-14511# Westinghouse Research and Development Center, Pittsburgh, Pa.

HIGH PRF HgBr LASER LIFE TESTING Final Report, 1 Apr. 1982 - 30 Apr. 1983

C. S. Liu and I. Liberman 30 Apr. 1983 12 p
(Contract N00014-82-C-0347)
(AD-A132660; Rept-9C7-LFTST-R1) Avail: NTIS HC A02/MF A01 CSCL 20/5

The major effort was to perform experimental life tests of an UV pre-ionized HgBr discharge laser, and verify noble metal (gold) electrodes for long life operation in the HgBr laser. Based on the test results of our gold-plated nickel HgBr laser there was no sign of laser deterioration at over 5,000,000 x 10 to the 6th power shots until unexpected and unnecessary blower problems forced us to interrupt the test. By operating the laser near threshold conditions gave a particularly sensitive test to chemical degradation. The previous laser discharge study and the true laser test indicated that the pinhole-free gold plated nickel was chemically inert to the HgBr. Both tests made us firmly believe that the properly designed HgBr laser can easily last 10 to the 8th power shots. For a larger laser system with further improved operating life, we suggest the addition of a HgBr2 reconstitution system.

GRA

N84-14512# California Univ., Livermore. Lawrence Livermore Lab.

HIGH GAIN FREE ELECTRON LASER AT ETA

T. J. Orzechowski, D. Prosnitz, K. Halbach, R. Kuenning, A. Paul, D. Hopkins, A. Sessler, G. Stover, J. Tanabe, and J. Wurtele 9 Feb. 1983 16 p refs Presented at the 2nd Natl. Conf. on High Power Microwave Technol., Adelphi, Md., 1 Mar. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE84-002001; UCRL-88705; CONF-830314-6) Avail: NTIS HC A02/MF A01

A single pass, tapered electron wiggler and associated beam transport was constructed. The system is designed to transport 1 kA of 4.5 MeV electrons ith an emittance of 30 millirad cm.

The planar wiggler is provided by a pulsed electromagnet. The interaction region is an oversized rectangular waveguide. Quadrupole fields stabilize the beam in the plane parallel to the wiggler field. The 3 meter long wiggler has a 9.8 cm period. The Free Electron Laser (FEL) serves as an amplifier for input frequencies of 35 GHz and 140 GZz. The facility is designed to produce better than 500 Megawatts peak power. DOE

N84-14513# Pennsylvania State Univ., University Park. Dept. of Physics.
STUDY OF FIELD ADSORPTION USING PULSED-LASER ATOM-PROBE FIELD-ION MICROSCOPY Annual Technical Progress Report, 1 Apr. 1983 - 31 Mar. 1984
T. T. Tsong 1983 6 p refs
(Contract DE-AC02-81ER-10857)
(DE84-002280; DOE/ER-10857/2) Avail: NTIS HC A02/MF A01

The high resolution pulsed-laser time-of-flight atom-probe, and the pulsed-laser imaging atom-probe are discussed. Under good operating conditions its mass resolution can be as high as 4000, or better. It is capable of separating for example (4)He(+) from D2(+), (3)He(+) from H3(+), and (56)Fe2(+) from N2(+) down to 5 or 10% of the peak height. This system is also a high resolution ion energy analyzer. The resolution, E/delta E, can be as high as 20,000 when heavy ions such as Au(+) and AuH2(+) are analyzed. Formation of H3(+) and NH3(+) was studied. Pulsed-laser field desorption of hydrogen results in formation of H(+), H2(+), and H3(+). The relative abundances of H(+) and H2(+) are found to be independent of the emitter materials or surface planes. They are dependent only on the applied field. Thus these ions, though formed right at or near the surface, are not surface catalyzed reaction products. They are formed by the high applied electric field. From the field dependence of their relative abundances, and the widening ion energy distribution width of the H(+) at higher field, it is concluded that H(+) is formed by field dissociation-ionization of H2(+). DOE

N84-14514# Deutsche Forschungsanstalt fuer Hubschrauber und Vertikalflugtechnik, Stuttgart (West Germany). Forschungsbereich Energetik.
CALCULATION OF PERFORMANCE OF AN RF-EXCITED TRANSVERSE FLOW CO2 LASER
Holger Jacoby Apr. 1983 91 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-832)
(DFVLR-FB-83-06; ESA-TT-832) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 27

A theoretical model based on a four temperature model and gas dynamic conservation equations is described in order to predict performances of an electrically exited transverse flow CO2 laser. The effects of gas mixture, flow velocity, pressure, temperature, and the characteristic properties of the electric discharge on small signal gain and saturation intensity were investigated. Good agreement is obtained between theory and the experimental measurements performed with a radio frequency excited transverse flow CO2 laser. Author (ESA)

N84-14515 California Inst. of Tech., Pasadena.
PARAMETRIC STUDY OF OPTICALLY PUMPED FAR-INFRARED WAVEGUIDE LASERS, PART 1. THEORY AND EXPERIMENT OF FOLDED FABRY-PEROT QUASI-OPTICAL RING RESONATOR DIPLEXER Ph.D. Thesis
Arthur Er-Terg Chiou 1983 150 p
Avail: Univ. Microfilms Order No. DA8315844

Part 1 deals with the problems related to the physics and the design of one of the extremely useful coherent sources in the FIR region of the electromagnetic spectrum: the optically-pumped FIR waveguide laser. The effects of small waveguide diameter were studied here particularly because of their importance to the practical realization of a compact coherent FIR laser. Part 2 deals with a problem related to the physics and design of a diplexer for application in the FIR heterodyne radiometry, where signals from the local oscillator and the received signal have to be directed into a detector for frequency mixing and for further signal processing. Since the signal of interest is typically very weak, the diplexer should serve the dual purpose of directing the two beams and filtering out the unwanted frequency components (noise) to enhance the signal to noise ratio, and do so with minimum loss. Dissert. Abstr.

N84-14182# Academy of Sciences (USSR), Gorky. Inst. of Applied Physics.
ALFVEN MASERS
V. Yu. Trakhtengerts *In* ESA Active Expts. in Space Jul. 1983 p 67-74 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14208# Hulburt (E. O.) Center for Space Research, Washington, D.C. Space Plasma Diagnostic Group.
REAL-TIME IN-SITU TARGETING OF GEOPLASMA DOMAINS FOR PURPOSES OF CHEMICAL INJECTION AND ARTIFICIAL TRIGGERING OF EQUATORIAL SPREAD-F
E. P. Szuszczewicz, D. N. Walker, J. C. Holmes, L. Kegley, M. Swinney, R. S. Narcisi (Air Force Geophysical Laboratory), J. Buchau, E. Trzcinski (Air Force Geophysical Laboratory), and B. Reinisch (Lowell Univ., Mass.) *In* ESA Active Expts. in Space Jul. 1983 p 265-269 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-14516 California Inst. of Tech., Pasadena.
FORCES ON A WHIRLING CENTRIFUGAL PUMP-IMPELLER Ph.D. Thesis
Dimitri Suhayl Chamieh 1983 220 p
Avail: Univ. Microfilms Order No. DA8315843

The possible forces of fluid dynamic origin can act on a turbomachine rotor particularly when it is situated off its normal center position. An experimental facility, the Rotor Force Test Facility, was designed and constructed in order to measure these kinds of forces acting on a centrifugal pump impeller when the latter is made to whirl a slightly eccentric circular orbit. The rotor speed, eccentric orbital radii and whirl speed could be varied independently. Quasi-steady forces on the impeller were measured as it whirls slowly about the axis of the pump rotation. These forces are due to interaction between the impeller and volute; they are decomposed into force components relative to the geometric center of the volute and to those proportional to displacement from this center. These latter are interpreted as stiffness matrices. These matrices were measured on two widely differing volute types and both were found to have the property of being skew-symmetric. Dissert. Abstr.

N84-14517 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Abt. Aeroakustik.
NOISE REDUCTION OF AUTOMOBILE TIRES [LAERMMINDERUNG AM PKw-REIFEN]
Anton Wolf and O. Bschorr 12 Jan. 1983 6 p ref In GERMAN Presented at 11th Intern. Congr. on Aeroacoustics, Paris, Lyon, Toulouse, 1983
(MBB-BB-539-83-Oe) Copyright. Avail: Issuing Activity

Changes in automobile tire structure were investigated in order to reduce the noise they produce. The changes were especially made with respect to damping and stiffness. A steel belt as multilayer damping coating leads to noise level reduction of up to 7dB(A) as compared to a reference tire. Measures to change the stiffness lead to reductions of up to 10dB(A). Tests show that driving stability and rolling friction are not influenced. Resonator-based noise shields fixed to the rims give reductions of up to 5dB(A). A better matching of the resonator design to the noise spectrum improves the reduction. Author (ESA)

N84-14518 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler und Verkehr.
HIGH POWER BOGIE FOR 350 KM/H. DESIGN AND DEFINITION [HOCHLEISTUNGSDREHGESTELL FUER 350 KM/H: KONZEPTION UND DEFINITION]
Hans-Dieter Blanke, Wolfram Ernst, Werner Geuenich, Folker Hanga, Helmut Hassel, Rolf Leo, Hans Joachim Melzer, Karl-Heinz Meusel, Walter Oefner, and Wilhelm Siebenaller Jul. 1981 240 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie
(MBB-UD-376-Oe) Avail: Issuing Activity

A high power bogie for a speed of 350 km/h was designed. The wheel set suspension and positioning system is made of fiber reinforced materials; it fulfills the spring suspension function and has sufficient torsional softness. The bogie is coupled to the carriage box by inclined air springs, traction and thrust bars, lateral and vertical dampers, and rolling stabilization. The construction of the wheel sets allows for easy replacement. The bogie is equipped with linear eddy current brakes and disk brakes which are centrally controlled via the train brake system and bogie characteristic calculator. Construction and simulation programs were used for the dynamic design. The main results are light weight, long life, high driving comfort, low permanent way load, high running power, and low noise production. Author (ESA)

N84-14519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A DYNAMIC ANALYSIS OF ROTARY COMBUSTION ENGINE SEALS
J. Knoll (Michigan Technological Univ.), C. R. Vilmann (Michigan Technological Univ.), H. J. Schock, and R. P. Stumpf 1984 15 p refs Proposed for presentation at the Ann. Congr. and Exposition, Detroit, 27 Feb. - 2 Mar. 1984; sponsored by SAE
(NASA-TM-83536; E-1902; NAS 1.15:83536) Avail: NTIS HC A02/MF A01 CSCL 11A

Real time work cell pressures are incorporated into a dynamic analysis of the gas sealing grid in Rotary Combustion Engines. The analysis which utilizes only first principal concepts accounts for apex seal separation from the crochoidal bore, apex seal shifting between the sides of its restraining channel, and apex seal rotation within the restraining channel. The results predict that apex seals do separate from the trochoidal bore and shift between the sides of their channels. The results also show that these two motions are regularly initiated by a seal rotation. The predicted motion of the apex seals compares favorably with experimental results. Frictional losses associated with the sealing grid are also calculated and compare well with measurements obtained in a similar engine. A comparison of frictional losses when using steel and carbon apex seals has also been made as well as friction losses for single and dual side sealing. Author

N84-14520# General Dynamics Corp., Warren, Mich. Land Systems Div.
AN EVALUATION OF AUTOMATED CONTROL OF THE OXY-FUEL CUTTING PROCESS FOR M1 VEHICLE FABRICATION Final Technical Report, 1 Jul. 1982 - 30 Jun. 1983
Jun. 1983 109 p
(Contract DAAE07-82-C-4058)
(AD-A134073; TACOM-TR-12852) Avail: NTIS HC A06/MF A01 CSCL 13/8

Southwest Research Institute (SwRI) conducted a feasibility study to evaluate the oxyfuel gas cutting process. Specific objectives of the project were: (1) To isolate the parameter(s) that show potential for use as process control signals. (2) To outline process control options from a relatively simple open loop control to a more sophisticated, fully automated, real-time closed loop control. The results of the feasibility study have shown that spectral radiance (temperature) in the infrared range near the top and bottom of the cutting front could provide control signals to minimize gouging and slag formation. The results of the acoustic monitoring have demonstrated that a high frequency acoustic sensor on the torch could be used to detect abnormal tip/torch behavior. Additionally, a high frequency sensor on the plate could be used to monitor gouging as well as excessive slag adhering conditions. However, since this method works after the fact i.e., after gouging has initiated, the temperature monitoring method is considered more suitable. The experimental data, supported by the literature review, lead to the conclusion that the common denominators of all flame cutting problems are the temperature at the cutting front and the iron-oxygen mixture ratio. A real-time closed loop system is described in this report. The details of the feasibility study are provided in this report. GRA

N84-14521# Sandia Labs., Livermore, Calif. Joining Model Lab. Div.
POROSITY DECREASE IN LASER WELDS OF STAINLESS STEEL USING PLASMA CONTROL
W. B. Estill and B. D. Formisano Nov. 1983 25 p refs
(Contract DE-AC04-76DP-00789)
(DE84-002194; SAND-83-8024) Avail: NTIS HC A02/MF A01

High energy laser welding incorporating plasma control was studied and reported by numerous investigations. Significant increases in laser weld penetration by use of plasma control was demonstrated. In addition to variations in weld penetration, drastic decrease in porosity and variation in weld bead shapes resulting from laser welds incorporating plasma control was shown. In particular, deep laser welds (greater than 6 mm) were produced in 304L stainless steel that show no root porosity and only very few, if any, detectable micropores. DOE

N84-14522# Sandia Labs., Albuquerque, N. Mex. Engineering Analysis Dept.
TAPE JOINT DESIGN GUIDELINES
Robert P. Rechard, Joseph T. Black, Jr., and Stanley D. Meyer Sep. 1983 28 p refs
(Contract DE-AC04-76DP-00789)
(DE84-002052; SAND-83-1506) Avail: NTIS HC A03/MF A01

The vital features of tape joint interlocking tabs and offset tape grooves and the assembly procedure are discussed. Important dimensions tape groove depth, area above and below the tape tunnel, length separating tape tunnel and interlocking tabs, and throat length and specifications necessary for the ensured sucess of the joint are explained. Application examples are presented that show the details associated with tolerancing and possible modifications are shown to demonstrate the versatility of the tape joint. DOE

N84-14523# Largo Solar Systems, Inc., Plantation, Fla.
DEVELOPING PROTO-TYPE PUMP WHICH WOULD UTILIZE UNIQUE THERMO-DYNAMIC CYCLE Final Report
1983 44 p
(Contract DE-FG44-81R4-10464)
(DE84-000323; DOE/R4-10464/T1) Avail: NTIS HC A03/MF A01

The development of a prototype pump working on the thermosyphon principle and useful as a circulating device for a solar domestic hot water system was described. Photographs and drawings illustrate the device. DOE

N84-14524# Sheffield Univ. (England). Dept. of Control Engineering.
LOAD CONTROL OF A 300 HP TUNNELLING MACHINE: CONTROLLER MODIFICATION AND TESTING FOR UNDERGROUND TRIALS
J. B. Edwards and S. M. Sadreddini Jun. 1983 25 p ref
(Contract NCB-226072)
(RR-230) Avail: NTIS HC A02/MF A01

An analog simulator of a tunneling machine is described and the performance of the load controller connected to the simulator is examined. Its performance is shown to accord closely with that predicted by simulation. A derivative-power, lead/lag compensator was implemented with additional passive components within the real controller and shown to produce the considerable improvements in stability and accuracy expected. The compensator is shown to behave equally well when load control is used in an overriding mode. Circuit improvements were made to ease the tuning of the system's load limit. Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-14525*# Ohio State Univ., Columbus.
VOLUME INTEGRALS ASSOCIATED WITH THE INHOMOGENEOUS HELMHOLTZ EQUATION. PART 1: ELLIPSOIDAL REGION Final Report
L. S. Fu and T. Mura Washington NASA Dec. 1983 19 p refs
(Grant NsG3-269)
(NASA-CR-3749; NAS 1.26:3749) Avail: NTIS HC A02/MF A01 CSCL 14D

Problems of wave phenomena in fields of acoustics, electromagnetics and elasticity are often reduced to an integration of the inhomogeneous Helmholtz equation. Results are presented for volume integrals associated with the Helmholtz operator, nabla(2) to alpha(2), for the case of an ellipsoidal region. By using appropriate Taylor series expansions and multinomial theorem, these volume integrals are obtained in series form for regions $r > 4'$ and $r < r'$, where r and r' are distances from the origin to the point of observation and source, respectively. Derivatives of these integrals are easily evaluated. When the wave number approaches zero, the results reduce directly to the potentials of variable densities. M.G.

N84-14526*# Ohio State Univ., Columbus.
VOLUME INTEGRALS ASSOCIATED WITH THE INHOMEGENEOUS HELMHOLTZ EQUATION. PART 2: CYLINDRICAL REGION; RECTANGULAR REGION Final Report
W. F. Zhong and L. S. Fu Dec. 1983 22 p refs
(Grant NAG3-340)
(NASA-CR-3750; NAS 1.26:3750) Avail: NTIS HC A02/MF A01 CSCL 20K

Results are presented for volume integrals associated with the Helmholtz operator, nabla(2) + alpha(2), for the cases of a finite cylindrical region and a region of rectangular parallelepiped. By using appropriate Taylor series expansions and multinomial theorem, these volume integrals are obtained in series form for regions $r > r'$ and $r < 4'$, where r and r' are distances from the origin to the point of observation and source, respectively. When the wave number approaches zero, the results reduce directly to the potentials of variable densities. M.G.

N84-14527# Naval Civil Engineering Lab., Port Hueneme, Calif.
PULSE ECHO ULTRASONIC TECHNIQUES FOR UNDERWATER INSPECTION OF STEEL WATERFRONT STRUCTURES Final Report, Oct. 1978 - Jul. 1982
R. L. Brackett, L. W. Tucker, and R. Erich Jun. 1983 92 p
(Y0995-01-004-310)
(AD-A133701; NCEL-TR-903) Avail: NTIS HC A05/MF A01 CSCL 13/12

Laboratory tests were made to: (1) determine the measurement accuracy using three different methods of acquiring and interpreting the ultrasonic data, (2) identify operator training requirements and optimum information feedback techniques for the diver, and (3) analyze the electrical power transmission characteristics of the ultrasonic system and identify any potential safety hazards to the diver. Due to the problems associated with multiple front surface echoes, digital ultrasonic thickness gages should not be used as the only means of inspecting steel structures in areas found to have irregular front surface conditions or where the thickness readings are found to fluctuate rapidly over a small area. Field tests of the ultrasonic scanner and surface milling adapter have confirmed that results comparable to those obtained during laboratory tests are attainable during in-situ inspection of steel pilings; since the ultrasonic scanner and milling adapter technique is not truly nondestructive in nature, however, it should be considered an interim inspection procedure. Investigation of alternative inspection techniques that do not require material removal should be continued. A power system test circuit should be incorporated into any 100-VAC circuit used to power underwater ultrasonic test equipment. As an additional safety precaution, inspection divers should be required to wear neoprene wetsuit gloves and should be instructed not to reach through the air/water interface while holding any grounded electronic equipment in their hands. GRA

N84-14528# Eagle Technology, Inc., Arlington, Va.
RELIABILITY PROGRAMS FOR NONELECTRONIC DESIGNS, VOLUME 2 Final Technical Report, 1 Sep. 1981 - 31 Aug. 1982
William H. Skewis Griffiss AFB, N.Y. RADC Apr. 1983 74 p 2 Vol.
(Contract F30602-81-C-0190; AF Proj. 2338)
(AD-A133625; RADC-TR-83-85-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 14/4

Current military standards for reliability programs, reliability predictions and qualification testing were written primarily for electronic equipment where component standardization and the valid assumption of an exponential failure rate permit their direct application. These electronic systems, however, often contain nonelectronic assemblies that are critical to operational readiness, mission success or logistics support. Application of current standards to nonelectronic designs depend upon the type equipment being developed, previous applications experience, quantity of equipment to be produced and many other factors. To help identify these characteristics and formulate a set of criteria on which to base recommendations, the Rome Air Development Center distributed over 400 questionnaires throughout the Department of Defense and related industries. Volume II emphasizes the distinguishing characteristics of nonelectronic designs and provides guidelines for tailoring current reliability documents to nonelectronic designs with consideration given to mission criticality, development phase, program dollars, development time and other program constraints. GRA

N84-14529# Eagle Technology, Inc., Arlington, Va.
RELIABILITY PROGRAMS FOR NONELECTRONIC DESIGNS, VOLUME 1 Final Technical Report, 1 Sep. 1981 - 31 Aug. 1982
William H. Skewis and Wade C. Mangum Griffiss AFB, N.Y. RADC Apr. 1983 135 p 2 Vol.
(Contract F30602-81-C-0190; AF Proj. 2338)
(AD-A133624; RADC-TR-83-85-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 14/4

Current military standards for reliability programs, reliability predictions and qualification testing were written primarily for electronic equipment where component standardization and the valid assumption of an exponential failure rate permit their direct application. These electronic systems, however, often contain nonelectronic assemblies that are critical to operational readiness, mission success or logistics support. Application of current standards to nonelectronic designs depends upon the type equipment being developed, previous applications experience, quantity of equipment to be produced and many other factors. To help identify these characteristics and formulate a set of criteria on which to base recommendations, the Rome Air Development Center distributed over 400 questionnaires throughout the Department of Defense and related industries. Volume I of this report summarizes the results of the survey on reliability programs for nonelectric designs. Contents include a description of the questionnaire; response to the survey in terms of analysis and testing tasks and program requirements; and the degree of correlation between analysis results, testing data and field performance. GRA

N84-14530# Naval Surface Weapons Center, White Oak, Md. Materials Evaluation Branch.
ULTRASONIC NDE OF BONDS IN MULTILAYERED SYSTEMS Final Report

Palmer L. Edwards 1 Aug. 1983 35 p
(SF61544508)
(AD-A133619; NSWC/TR-83-314) Avail: NTIS HC A03/MF A01
CSCL 14/2

Presented here is a report on a program to develop a procedure to use ultrasonics to nondestructively detect flaws in the bonding of layered materials. The program was begun by the Materials Evaluation Branch in 1981, and up to the present time the work has been done primarily through contracts with Tetra Tech, Inc., of Arlington, Virginia. The first contract period involved the development of a computer model utilizing normal-incidence beams, the design of the experiments to test the model, the performance of the experiments in collaboration with personnel at NSWC, and the analysis of the experimental results. At the end of the first contract period Tetra Tech recommended that angled beams be used rather than the normal-incidence beams that had been used, and this was done in the second year. The computer model developed under the first contract was modified to be used with angled beams. Experiments performed at 5 MHz with a bronze-epoxy-aluminum structure gave results consistent with the computer model relative to transit times, but questions exist relative to the model's determination of reflection coefficients at the structure's interfaces. Experiments performed at 1 MHz with a simulated bronze-epoxy-rubber-epoxy-bronze structure showed observable signals due to disbonds from as deep into the structure as the bottom side of the rubber plate. GRA

N84-14531# GARD, Inc., Niles, Ill. Electronic Systems Dept.
ULTRASONIC INSPECTION FOR ROADWHEEL BONDLINE QUALITY Final Report, Sep. 1979 - Oct. 1982
I. R. Kraska Warren, Mich. Army Tank-Automotive Command Mar. 1983 53 p
(Contract DAAK30-79-C-0121)
(AD-A132608; TACOM-TR-12728) Avail: NTIS HC A04/MF A01
CSCL 14/2

This project was directed at evaluating the feasibility of using ultrasonics, coupled with a unique microprocessor signal analysis and processing system, to determine rebuilt roadwheel quality. A series of roadwheels were ultrasonically tested, with the data recorded for subsequent computer analysis. The wheels were then either peel, drum, or road tested. A subsequent comparison between certain ultrasonic signal characteristics (signal amplitude and % circumferential phase change) and roadwheel disposition allowed accept/reject limit selection which provided 80% correct prediction of road failures by ultrasonics, with an 86% overall correct prediction of road tests results. When compared to peel results on the same set of roadwheels (60% and 50%), the ultrasonic results are encouraging. Limitations on conclusions, due to sample size and related assumptions, are severe. However, further work is indicated, directed at establishing the viability of the described ultrasonic test procedures for both manufacturing quality control and on-vehicle readiness evaluation. The former is already underway. An approach to the latter is suggested.
Author (GRA)

N84-14532# California Univ., Berkeley. Operations Research Center.
ON THE USE OF REPLACEMENTS TO EXTEND SYSTEM LIFE
Cyrus Derman, Gerald J. Lieberman, and Sheldon M. Ross Jun. 1983 49 p
(Contract N00014-75-C-0561; Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A132878; ORC-83-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with the following question. A system has one vital component for which there are n spares. Whenever the vital component fails, the system fails. The authors like to schedule the replacement of the vital component with the spares so as to prolong the life of the system as much as possible. This problem can be generalized to where there are several components in the system and the scheduling of replacements refers to each of the components. They deal mainly with the first question but treat, to some extent, a special case of the second. The next to final section considers a generalization which allows for the vital component to fail a fixed number of times before causing the system to fail. GRA

N84-14533# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
AN INSTRUMENT FOR THE CHARACTERIZATION OF DEFECTS IN ULTRASONIC INSPECTIONS [UNO STRUMENTO PER LA CARATTERIZZAZIONE DI DIFETTI NELLE ISPEZIONI ULTRASONORE]
G. Redondi and F. Tonolini 1983 11 p In ITALIAN Presented at 3rd Congr. Nazl. Dell'Assoc. Ital. Prove-non-Distruttive, Venice, 19-21 May 1983
(Contract ISEA-2E/000)
(CISE-2073) Avail: NTIS HC A02/MF A01

A device for data acquisition, data recording and signal analysis in ultrasonic field inspection is described. The instrument is based on a desktop computer and can be used with any conventional ultrasonic instrument. A permanent record of the inspection is made. The software permits echo analysis following standard procedures or more sophisticated processing. The echo frequency spectra which characterize the type and dimension of the defect are obtained. Author (ESA)

N84-14534# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
A COMPARISON BETWEEN NEW AND TRADITIONAL ULTRASONIC TECHNIQUES ON THICK WELDS IN PRESSURE VESSELS [UN ESPERIENZA DI CONFRONTO FRA TECNICHE AD ULTRASUONI NUOVE E TRADIZIONALI, SU SALDATURE DI GROSSO SPESSORE DI CORPI A PRESSIONE]
M. Certo, G. Gammino, G. Redondi, and G. Nardoni (ATB, Brescia, Italy) 1983 12 p In ITALIAN Presented at 3rd Congr. Nazl. dell'Assoc. Ital. Prove-non-Distruttive, Venice, 19-21 May 1983
(Contract ISEA-2E/000)
(CISE-2074) Avail: NTIS HC A02/MF A01

A multifrequency acoustic holographic test method for weld inspection is discussed. Measurements were performed using a conventional ultrasonic system of 2 MHz frequency, 45 and 60 deg angle, and detector dimensions of 20 x 22 mm. The scanning direction was always perpendicular to the weld axis. A reference conventional measurement was carried out using a 6 dB drop procedure. The holographic inspection was performed in four areas of 128 x 128 mm. The holographic method uses as starting data a series of holograms obtained at different frequencies to assure good axial resolution. It is concluded that this technique is complementary to X-ray techniques in thick weld checks, giving good resolution images even in the cases for which X-rays require long exposition times or costly linear accelerators. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-14535 California Inst. of Tech., Pasadena.
THE EMERGENCE AND PROPAGATION OF A PHASE BOUNDARY IN AN ELASTIC BAR Ph.D. Thesis
Thomas James Pence 1983 128 p
Avail: Univ. Microfilms Order No. DA8315856

In an elastic bar whose stress-strain relation is not monotonic, sufficiently large applied loads require the strain to jump from one ascending branch of the stress-strain curve to another such branch. For a special class of these materials, a nonlinear initial boundary value problem in one dimensional elasticity is considered for a semiinfinite bar whose end is subjected to either a monotonically increasing prescribed traction or a monotonically increasing prescribed displacement. If the stress at the end of the bar exceeds the value of the stress at any local maximum of the stress-strain curve a strain discontinuity or "phase boundary" emerges at the end of the bar and subsequently propagates into the interior. For classically smooth solutions away from the phase boundary, the problem is reducible to a pair of differential delay equations for two unknown functions of a single variable. The first of these two functions gives the location of the phase boundary, while the second characterizes the dynamical fields in the high strain phase of the material. Dissert. Abstr.

N84-14536 Iowa State Univ. of Science and Technology, Ames.
DEVELOPMENT OF THE LINEAR DISPLACEMENT DISCONTINUITY METHOD Ph.D. Thesis
Mahmoud C. Assaad 1983 125 p
Avail: Univ. Microfilms Order No. DA8316137

The displacement discontinuity method is reviewed as a numerical technique for computing stresses and displacements distribution over a plane area in a homogeneous, isotropic, linearly elastic material. The elementary solution for a single line crack in an infinite body is derived. The displacement function over the line segment is assumed to be linear of the form ax + b where a and b are functions of the displacement at the extreme nodes of the time segment. The numerical technique used to overcome the indefinite values of the analytical solution at the singular node points is explained. The problem of a pressurized line crack in an infinite body is fully investigated. Also studied are the problems of a circular disk acted upon by uniform radial pressures, and a circular hole in a thin infinite plate subjected to uniaxial tensile loads. In all cases, values resulting from the application of the linear displacement discontinuity method, the constant displacement discontinuity method and the theoretical method are examined and compared. The computer programs used to obtain the numerical results are documented. Dissert. Abstr.

N84-14537 Pennsylvania Univ., Philadelphia.
A MICROSCOPIC ANALYSIS OF BRITTLE FRACTURE IN DEFORMABLE SOLIDS Ph.D. Thesis
Martin Louis Jokl 1983 248 p
Avail: Univ. Microfilms Order No. DA8316038

The fracture criterion for a plastically deformable crystal was examined by considering the energy involved in the fracture process. As the crack extends, elastic energy stored in the solid is released, and some of this energy is absorbed in the breaking of bonds and the concomitant creation of new crack surface. Equating these two energies yields the familiar Griffith criterion for perfectly linear-elastic solids. However, other processes that dissipate energy can occur near the crack tip. For example, it is shown that dislocation generation at the crack tip can dissipate far more than the energy associated with bond breaking. Here dislocation generation does not refer to the creation of unit dislocations, but rather, to local inelastic shear that is restricted to the immediate vicinity of the crack tip. Pre-existing cracks do not extend in deformable solids, but simply act as stress concentrators that increase the likelihood that a second-phase particle may fracture and extend into the deformable matrix. Dissert. Abstr.

N84-14538 Northwestern Univ., Evanston, Ill.
NUMERICAL METHODS FOR JOINTED MEDIA AND STRUCTURES Ph.D. Thesis
Michael Edward Plesha 1983 108 p
Avail: Univ. Microfilms Order No. DA8315963

Efficient numerical procedures were developed for the static and dynamic analysis of jointed media and structures. The jointed medium is idealized as a set of rigid bodies and interaction is assumed to be edge-to-edge. Static analysis is performed by a stiffness method; the nonlinear equilibrium equations are solved by an iteractive secant method. This procedure yields the equilibrium configuration of a jointed medium or structure subject to a zero joint tension criterion and a Mohr-Coulomb friction law. It is shown that the minimum friction coefficient which results in a stable structure is independent of the joint elastic properties. Dynamic analysis is performed by implicit-explicit time integration. The linear portion of the response is modeled implicity and the nonlinear portion is modeled explicity. The method features the stability of implicit procedures as well as the flexibility of explicit procedure for nonlinear problems. The solutions obtained with this method are compared to the solutions obtained by the explicity central difference methods. For some problems, it is shown that the implicit-explicit method can result in substantial savings over more conventional explicit methods. Dissert. Abstr.

N84-14539 Akron Univ., Ohio.
BUCKLING ANALYSIS OF END RESTRAINED IMPERFECT TUBULAR BEAM COLUMNS Ph.D. Thesis
Rui Manuel Menezes CarneirodeBarros 1983 221 p
Avail: Univ. Microfilms Order No. DA8315523

The influence coefficient method is available for the buckling analysis of elasto-plastic, end-restrained, space tubular beam-columns. A consistent formulation of the effects of initial imperfections, eccentricities of the loading, applied end moments, material nonlinearities and end-restraints, is presented in the context of small deflection theory. The derivation and calibration of beam-column and end-restraint systems is reported. Experimental performance of complex and restraint joint systems is investigated to determine the characteristic calibration curves of spatial end-restraint. In addition the results of a sequence of experimental buckling tests, conducted for obtaining empirical data on end-restrained tubular beam-columns, are described. The elasto-plastic buckling analysis is improved by using a modified Crisfield's constrained displacement length method. Several examples are included to demonstrate the usage of the numerical procedure, and the results are compared with those of the experiments. A parametric study of end-restraint effects on imperfect tubular beam-columns is presented. Dissert. Abstr.

N84-14540 Georgia Inst. of Tech., Atlanta.
BENDING OF BEAMS, PLATES AND LAMINATES: REFINED THEORIES AND COMPARATIVE STUDIES Ph.D. Thesis
Ramakrishna Rao Valisetty 1983 370 p
Avail: Univ. Microfilms Order No. DA8315362

Bernouli-Euler beam theory, Kirchhoff's plate theory and classical laminated plate theory are the principal tools for the analysis of slender beams, thin plates and laminates. Theories which account for transverse shear deformations are extensions of these engineering theories. There are, however, additional factors that influence bending-related behavior. They include the consequences of section warping and its concomitant nonclassical surface-parallel stress contributions and transverse normal strain. For materials that are characterized by relatively low elastic moduli in the lateral and transverse directions. These influences are much more pronounced than for conventional isotropic materials. Modern graphite/epoxy composites belong to this class. As these materials are increasingly favored for application, it is imperative that adequate analytical prediction capability be available. It is also desired for the improved theories to retain simplicity consistent with the needed refinements. This facilities understanding, ease of application and maximum use of existing computational resources. Dissert. Abstr.

N84-14541*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPLEXITIES OF HIGH TEMPERATURE METAL FATIGUE: SOME STEPS TOWARD UNDERSTANDING
S. S. Manson and G. R. Halford 1983 47 p refs Presented at the 25th Ann. Conf. on Aeronautics and Astronautics, Haifa, Isreal, 23-25 Feb. 1983
(NASA-TM-83507; E-1852; NAS 1.15:83507) Avail: NTIS HC A03/MF A01 CSCL 20K

After pointing out many of the complexities that attend high temperature metal fatigue beyond those already studied in the sub-creep range, a description of the micromechanisms of deformation and fracture is presented for several classes of materials that were studied over the past dozen years. Strainrange Partitioning (SRP) is used as a framework for interpreting the results. Several generic types of behavior were observed with regard both to deformation and fracture and each is discussed in the context of the micromechanisms involved. Treatment of cumulative fatigue damage and the possibility of "healing" of damage in successive loading loops, has led to a new interpretation of the Interaction Damage Rule of SRP. Using the concept of "equivalent micromechanistic damage" – that the same damage on a microscopic scale is induced if the same hysteresis loops are generated, element for element – it turns out the Interaction Damage Rule essentially compounds a number of variants of hysteresis loops, all of which have the same damage according to SRP concepts, into a set of loops each containing only one of the generic SRP strainranges. Thus the damage associated with complex loops comprising several types of strainrange is analyzed by considering a combination of loops each containing only one type of strainrange. This concept is expanded to show how several independent loops can combine to "heal" creep damage in a complex loading history. Author

N84-14542*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A SIMPLIFIED METHOD FOR ELASTIC-PLASTIC-CREEP STRUCTURAL ANALYSIS

Albert Kaufman 1984 19 p refs Proposed for presentation at the 29th Ann. Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984; sponsored by ASME
(NASA-TM-83509; E-1855-1; NAS 1.15:83509) Avail: NTIS HC A02/MF A01 CSCL 20K

A simplified inelastic analysis computer program (ANSYPM) was developed for predicting the stress-strain history at the critical location of a thermomechanically cycled structure from an elastic solution. The program uses an iterative and incremental procedure to estimate the plastic strains from the material stress-strain properties and a plasticity hardening model. Creep effects are calculated on the basis of stress relaxation at constant strain, creep at constant stress or a combination of stress relaxation and creep accumulation. The simplified method was exercised on a number of problems involving uniaxial and multiaxial loading, isothermal and nonisothermal conditions, dwell times at various points in the cycles, different materials and kinematic hardening. Good agreement was found between these analytical results and nonlinear finite element solutions for these problems. The simplified analysis program used less than 1 percent of the CPU time required for a nonlinear finite element analysis. Author

N84-14543# Lockheed Missiles and Space Co., Sunnyvale, Calif. Engineering Technology.

AEROELASTIC STABILITY ANALYSIS OF THE LIGHT WEIGHT TANK LH-2 CABLE TRAY

Lars E. Ericsson and J. Peter Reding Oct. 1983 84 p refs Prepared for Martin Marietta Corp., New Orleans, La.
(LMSC/D059511) Avail: NTIS HC A05/MF A01

An aeroelastic stability analysis of the space shuttle Light Weight Tank (LWT) Liquid Hydrogen (LH2) cable tray was performed using static experimental results. Two flow phenomena were identified which have adverse aeroelastic effects: one is a sudden flow separation on the bottom side of the cable tray, documented by static experimental results; the other is vortex burst on the top side, which is hypothesized as being possible as it fits within the experimental data base presently available. The analysis shows that the sudden separation phenomenon generates dynamic loads that are within the structural capability of most cable tray segments. However, the vortex burst phenomenon generates excessive dynamic loads and further tests are needed to make sure that it does not occur, before the protective flow ramps are removed. Author

N84-14544# Materials Research Labs., Melbourne (Australia).

BENDING OF BEAMS SUBJECTED TO TRANSVERSE IMPACTS

R. L. Woodward Apr. 1983 24 p refs
(MRL-R-886; AR-003-299) Avail: NTIS HC A02/MF A01

Transverse projectile impacts on the ends of free-free beams of circular cross section produced evidence of hinges in the beams and strain distributions which are used for comparisons with a rigid-plastic approach to the dynamic response of structures and for comparisons with a finite element computer code solution. The rigid-plastic approach describes the mechanism of bending and hinge development and motion correctly but the simplifications inherent in the model prevent it from accurately predicting the detail. The computer code EPIC-2 gives extremely good simulations of the problem. Author

N84-14545# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.

INITIATION, GROWTH, AND COALESCENCE OF SMALL FATIGUE CRACKS Annual Scientific Report, 15 Jan. 1982 - 15 Jan. 1983

A. F. Grandt, Jr. May 1983 86 p
(Grant AF-AFOSR-0041-82; AF Proj. 2307)
(AD-A133935; AFOSR-83-0867TR) Avail: NTIS HC A05/MF A01 CSCL 20/11

This interim report summarizes the first year's progress on a research effort directed at studying the initiation, growth, and coalescence of small fatigue cracks at notches. A fracture mechanics based model is described to predict the growth and coalescence of multiple cracks located at notches. Stress intensity factors are presented for interacting cracks located at holes. The predictive model is compared with experimental results obtained with multiply cracked specimens made from a transparent polymer. Current efforts and future goals are also briefly described. Author (GRA)

N84-14546# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.

EXPERIMENTAL STUDY OF ACTIVE VIBRATION CONTROL Annual Report, 15 Mar. 1982 - 14 Mar. 1983

William L. Hallauer, Jr. 15 Apr. 1983 11 p
(Grant AF-AFOSR-0217-82; AF Proj. 2307)
(AD-A133818; AFOSR-83-0855TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

Control system hardware, including velocity sensors, force actuators, and analog circuitry, has been designed, fabricated, calibrated, and tested in operation. Active vibration control in the forms of direct-velocity-feedback control and modal-space control has been implemented on a dynamically uncomplicated beam-cable structure, and theoretical simulations of the structure-control dynamics have been completed. Either correlation between experiment and theory has been satisfactory, or the reasons for unsatisfactory correlation have become clear so that corrections can be made in the future. A dynamically complicated, variable-geometry plane grid structure intended for control experiments has been built and analyzed experimentally and theoretically for its modes of vibration. The initial versions of both the actual structure and its theorectical model was unsatisfactory in some respects, and necessary improvements are almost completed at this writing. Finally, the tasks of subcontractor HR Textron are almost completed. They consist of a study of the techniques known as component cost analysis and modal cost analysis and a preliminary study of issues involved in the testing of active vibration control systems of full-size satellite structures, most specifically whether testing should be conducted on the ground or in orbit. Author (GRA)

N84-14547# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

FRACTURE TOUGHNESS OF FIBER REINFORCED CONCRETE Progress Report, Jun. 1982 - Jun. 1983

M. Wecharatana and S. P. Shah 1 Jun. 1983 84 p Submitted for publication
(Grant AF-AFOSR-0243-82; AF Proj. 2307)
(AD-A133809; AFOSR-83-0876TR) Avail: NTIS HC A05/MF A01 CSCL 11/2

For fiber reinforced cement based composites, the principal beneficial effects of fibers (metallic, mineral or organic) accure after the matrix has cracked. For loads beyond which the matrix has initially cracked, the further crack extension and opening is resisted by bridging of fibers across the cracks. The resistance provided by the fibers will depend prinicipally on the debonding and the pull-out resistance of fibers. A theoretical model based on the concepts of nonlinear fracture mechanics to predict the resistance provided by the fibers against the fracture of matrix is presented in this report. The theoretically predicted response is compared favorably with the experimental data on notched beams and double cantilever beam specimens of steel fiber reinforced concrete. The proposed theoretical model provides a method to calculate fracture resistance for a crack extension in a specimen of any geometry. One of the key parameters required for the model is the relationship between the uniaxial post-cracking stress and the corresponding displacement. This relationship will depend on the bond-slip function of fibers. A method to estimate this relationship is presented. GRA

N84-14548# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.

MECHANICAL RESPONSE OF MATERIALS WITH PHYSICAL DEFECTS. PART 3. A MATERIAL TESTING PROGRAM FOR SIZE AND RATE EFFECTS Final Technical Report, 1 Jan. 1982 - 30 Mar. 1983

G. C. Sih and P. Matic Jul. 1983 49 p
(Grant AFOSR-82-0194; AF Proj. 2307)
(AD-A133762; IFSM-83-117; AFOSR-83-0871TR) Avail: NTIS HC A03/MF A01 CSCL 20/11

A fundamental problem of structural analysis is the prediction of the final failure made. Traditional approaches to the extreme forms of failure, i.e., plastic collapse and fracture instability, invoke a particular failure criterion to address one assumed failure mode. The appearance of the other mode is precluded by such an approach. A criterion is presented which addresses both macrocrack propagation and local changes in material properties using strain energy density. The damage state of the material at a particular instant of its load history is assumed to be governed by loading versus unloading behavior of the material's constitutive law. Macrocrack instability is assumed to occur when the size of the core region around the crack tip exceeds the predicted growth increment. This core region is defined by the closed contour of constant strain energy density equal to the maximum value addressed by the constitutive law. Crack growth increments occur in the direction of minimum strain energy density. The length of the crack growth increment is governed by the relative toughness of the material in the direction of propagation. GRA

N84-14549# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.

ANALYSIS OF THE NONLINEAR LARGE DEFORMATION BEHAVIOR OF COMPOSITE CYLINDRICAL SHELLS Final Report, 30 Jun. 1981 - 30 Jun. 1983

George J. Simitses, Izhak Sheinman, and Dein Shaw 1983 88 p
(Grant AF-AFOSR-0227-81; AF Proj. 2307)
(AD-A133761; AFOSR-83-0870TR) Avail: NTIS HC A05/MF A01 CSCL 20/11

The governing equations for the nonlinear analysis of imperfect, stiffened, laminated, circular, cylindrical, thin shells, subjected to uniform axial compression and torsion, and supported in various ways, are derived and presented. Two types of formulations have been developed; one (w,F-Formulation) is based Donnell-type nonlinear kinematic relations; and the other (u, v, w - formulation) is based on Sanders' -type of nonlinear kinematic relations (small strains, moderate rotations about in-plane axes). A solution methodology is developed and presented. Numerical results are generated for certain special geometries, and these serve as bench marks for the solution scheme. Parametric studies are performed for composite cylinders. The scope of these studies is to assess the effect of geometric imperfections lamina stacking, and length of radius ratio. The solution scheme is also tested by comparing theoretical predictions (critical loads based on the developed methodology) to experimentally obtained results. GRA

N84-14550# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

WAVE ATTENUATION IN DAMPED PERIODIC STRUCTURES Interim Technical Report

Robert Plunkett and Ajit K. Roy 12 Jul. 1983 32 p
(Contract N00014-82-K-0591)
(AD-A133736) Avail: NTIS HC A03/MF A01 CSCL 20/1

It is known that periodic structures will act as filters for bending waves. The equations for an infinite ribbed bar have been published. The objective of this study is to get extensive quantitative results, both analytical and experimental, for a finite number of tuned ribs and to extend the work to plates and possibly shells. In the process, we intend also to investigate the differences between symmetric (two-sided) and asymmetric (one-sided) cantilever ribs. This first technical report gives analytical and experimental results for the uniform bar (unribbed) and for the same bar with fifteen pairs of tuned cantilevers which approximates the infinite ribbed bar. GRA

N84-14551# Air Force Weapons Lab., Kirtland AFB, N. Mex.

DIRECT SHEAR FAILURE IN REINFORCED CONCRETE BEAMS UNDER IMPULSIVE LOADING Ph.D. Thesis - Stanford Univ. Final Report

Timothy Jack Ross Sep. 1983 232 p
(AF Proj. 8809)
(AD-A133666; AFWL-TR-83-84) Avail: NTIS HC A11/MF A01 CSCL 13/13

An analytic procedure is developed, using classic elastic Timoshenko beam theory, to define conditions under which reinforced concrete beams and one-way slabs can fail in a direct shear mode when subjected to distributed impulsive loading. The procedure is based on the assumption that incipient failure occurs in direct shear when the beam support shear exceeds a strength threshold before the support bending moment attains its ultimate capacity. The Timoshenko theory is extended to include rotational beam-end restraint and to account for viscoelastic material response to assess qualitatively the influence of rate effects on shear and bending moment. Dynamic failure in direct shear is presumed to behave in accordance with currently accepted static shear transfer mechanisms. Dynamic failure criteria are extrapolated from static criteria with the use of an enhancement factor based on increased material strengths due to load rate. Failure curves, defining peak pressure versus rise time domains where direct shear failure is possible, are compared to experimental evidence for specific beam geometries and load rates. Post failure deterministic and stochastic models are introduced as candidates for analysis beyond incipient shear failure. It is concluded that direct shear failures can be predicted for certain combinations of load parameters. Rate effects enhance shear forces more than bending moments during transient response. Strength enhancement due to load rate reduces the domain of load parameters over which a direct shear failure can take place, whereas a relaxation of beam-end restraint increases this domain considerably. GRA

N84-14552# Materials Research Labs., Ascot Vale (Australia).

A TORSION TESTING MACHINE FOR MEASUREMENT OF SHEAR STRENGTH OF FOAM

N. J. Baldwin Dec. 1982 16 p
(AD-A133027; MRL-TN-469) Avail: NTIS HC A02/MF A01 CSCL 07/4

A torsion machine has been development to measure shear strength and shear modules of foam. The machine is compact, portable, easy to use and is an essential link in quality assurance of foam core material for the Australian Minehunter Catamaran. Author (GRA)

N84-14553# Hanford Engineering Development Lab., Richland, Wash.

USE OF SUBSIZED SPECIMENS FOR EVALUATING THE FRACTURE TOUGHNESS OF IRRADIATED MATERIALS

F. H. Huang Oct. 1983 26 p refs Presented at the Symp. on the Use of Nonstandard Subsized Specimens for Irradiated Testing, Albuquerque, N. Mex., 23 Sep. 1983
(Contract DE-AC06-76FF-02170)
(DE84-001500; HEDL-SA-2907-FP; CONF-8309170-2) Avail: NTIS HC A03/MF A01

The effects of specimen size, temperature and irradiation on fracture toughness were studied in unirradiated compact tension specimens of alloy A286 and HT-9 and irradiated specimens of 20 percent cold worked Type 316 stainless steel. Techniques for specimen preparation and test procedures were developed. Fracture toughness tests on these precracked specimens were conducted at various temperatures and test results were analyzed using the multiple specimen R-curve method. Due to irradiaion hardening and postirradiation toughness degradation, sufficient constraint existed in thin irradiated specimens to permit the application of the J-integral approach. Analysis showed the absence of a significant size effect and that the size requirements for a valid J/sub 1c/ test were satisfied, indicating that small specimens may be used for post-irradiation fracture toughness testing. Results are discussed in terms of size criteria for valid J/sub 1c/ determination and conditions for J-controlled crack growth. DOE

N84-14554# Massachusetts Inst. of Tech., Cambridge. Nuclear Reactor Lab.
MIT MINIATURIZED DISK BEND TEST
O. K. Harling, M. Lee, D. S. Sohn, G. Kohse, and C. W. Lau
23 Sep. 1983 28 p refs Presented at the Symp. on the Use of Nonstandard Subsized Specimens for Irradiated Testing, Albuquerque, N. Mex., 23 Sep. 1983
(Contract DE-AC02-78ER-10107)
(DE84-001275; DOE/ER-10107/22; CONF-8309170-5) Avail: NTIS HC A03/MF A01

A miniaturized disk bend test (MDBT) using transmission electron microscopy specimens for the determination of various mechanical properties is being developed at MIT. Recent progress in obtaining strengths and ductilities of highly irradiated metal alloys is reviewed. Other mechanical properties also obtained using the MDBT approach. Progress in fatigue testing and in determination of the ductile-to-brittle transition temperature is reviewed briefly. DOE

N84-14555# National Maritime Inst., Feltham (England).
AN ASSESSMENT OF SOME METHODS FOR CALCULATING WAVE LOADING
W. J. Brendling Mar. 1983 25 p refs Sponsored by Offshore Energy Technology Board
(NMI-R-162; OT-O-8319; P/302112) Avail: NTIS HC A03/MF A01

Wave forces on slender members of offshore structures were calculated. Forces on a vertical member from the sea bed to above the wave crests, and a completely submerged horizontal member were estimated using Morison's equation, either with the quadratic drag term or its linearized form. The wave motions of the water were calculated using Airy (linear), Stokes V, and stream function wave theories. The force on the members in an irregular sea was also calculated by linear spectral superposition. For the vertical member, neglecting the nonlinear force on elements between the mean and instantaneous free surface levels results in the underestimation of the peak force on the member by 13%. For the horizontal member the major nonlinearity is the quadratic drag term. If this drag is linearized, approximations which merely separate the horizontal and vertical velocity components do not accurately represent the member in all orientations. The differences due to the use of the high order wave theories are less than the uncertainties in Morison's equation, particularly the mass and drag coefficients. Author (ESA)

N84-14556# Earthquake Engineering Research Inst., Berkeley, Calif.
ANSR-3: GENERAL PURPOSE COMPUTER PROGRAM FOR NONLINEAR STRUCTURAL ANALYSIS
Carlo Vahe Oughourlian and Graham H. Powell Nov. 1982 251 p refs
(Grant NSF CEE-81-05790)
(PB83-251330; UCB/EERC-82-21; NSF/CEE-82115) Avail: NTIS HC A12/MF A01 CSCL 13B

ANSR is a general purpose computer code for the static and dynamic analysis of nonlinear structures. This third version which substantially extends and improves ANSR-1 and ANSR-2 has the following new features: a flexible and substantially automatic static analysis strategy, two separate options for dynamic analysis, namely a new event to event scheme and an improvement of the earlier iteration scheme, visco-static and creep analysis options, an option for rotated coordinate systems, configuration dependent static loading, time history record interpolation to allow variable time step analysis and arbitrary time delays for loading by propagating waves, an option for the Hilber-Hughes-Taylor integration method for dynamic analysis, simpler and more modular iteration logic for static, dynamic and visco-static analysis, energy balance calculations for dynamic analysis, reorganization of element data and computational modules for greater generality and flexibility, and an improved element library. GRA

N84-14557# Florida Dept. of Transportation, Gainesville. Bureau of Materials and Research.
RELATIONSHIP OF BENKELMAN BEAM DEFLECTION AS MEASURED BY FLORIDA METHOD TO THOSE MEASURED BY AASHTO METHOD T-256-77, P-13-79 Final Report
G. C. Page, W. G. Miley, and R. L. McNamara Feb. 1983 77 p
Sponsored in part by FHA
(PB83-252973; FL/DOT/BMR-83/259) Avail: NTIS HC A05/MF A01 CSCL 13B

The Florida Department of Transportation (FDOT) was using a procedure to measure pavement deflection since 1982 and a history of performance versus deflection was obtained. The FDOT procedure differs from AASHTO-256-77 which is used by many othe states. A field test was set up to determine the relationship between the two test methods. The test results indicate that data obtained with both methods correlated with reasonable accuracy. It is recommended that Florida continue to use its test method but to consider certain modifications in the equipment used for loading. GRA

N84-14558 Lehigh Univ., Bethlehem, Pa.
COUPLED DIFFUSION AND DEFORMATION THEORY: HYGROTHERMAL STRESS DISTRIBUTION AROUND CRACK-LIKE DEFECTS Ph.D. Thesis
Ming-Tsung Shih 1983 197 p
Avail: Univ. Microfilms Order No. DA8317139

The coupling of moisture, temperature and deformation in composite materials containing cavities or crack-like defects was studied. The composite is assumed to behave as a quasi-isotropic material. A system of governing equations is derived from the principle of irreversible thermodynamics. Transient boundary conditions are prescribed in terms of the combination of moisture, temperature and stress or displacement. The transient character of the stress and energy density distribution around a circular and elliptical cavity in a cross-ply T300/5208 graphite epoxy resin laminate is obtained numerically by means of an iterative procedure. Time depending is solved by application of Laplace transform as an eigenvalue problem. The finite element technique is then used to obtain the non-uniform distribution of moisture, temperature and stress in the solid. When diffusion and deformation are coupled, even the diffusion coefficients for plane stress must be distinguished from plane strain. Dissert. Abstr.

N84-14559 Tufts Univ., Medford, Mass.
A SUCCESSIVE TRANSFORMATION METHOD FOR THE DYNAMIC ANALYSIS OF DAMPED SYSTEMS Ph.D. Thesis
Liren Wu 1983 246 p
Avail: Univ. Microfilms Order No. DA8316863

A new approach, the Successive Transformation Method (STM), is presented to analyze linear dynamic systems with general viscous damping. The method features two successive transformations to the subsystem equations written in first order, state space form. The transformations are applied to each subsystem, making consecutive use of free interface undamped modes in the existing physical coordinates followed by fixed interface damped modes in the generalized coordinates. Numerical examples are carried out to test the applicability of the new method to eigenproblems, forced vibration problems and initial condition problems. The results show that the method can reduce the scale of dynamic analysis problems to a great extent while the solutions still remain acceptable for engineering purposes. Dissert. Abstr.

N84-14560 Stanford Univ., Calif.
ACOUSTOELASTICITY: SCANNING WITH SHEAR WAVES Ph.D. Thesis
Nisar Shaikh 1983 87 p
Avail: Univ. Microfilms Order No. DA8314489

Acoustoelasticity is a promising method for the in situ analysis of both applied and residual stresses in metals. Earlier investigators at Stanford University have developed phase measurement techniques and applied them to longitudinal wave scanning, which is able to provide the hydrostatic component of a state of plane stress. A technique for utilizing shear waves, which are necessary to obtain all the components of stress and the directions of principal stresses was established. Suitable contact shear wave transducers, a scanning machine, a measurement technique, and an acoustoelasticity theory for anisotropic materials were developed. The theory of acoustoelasticity for anisotropic materials were developed. The theory of acoustoelasticity for anisotropic material was developed using perturbation techniques. This resulted in a method for the characterization of the anisotropy in the unstressed material and the subsequent effect of superimposed stress. Dissert. Abstr.

N84-14561 Nebraska Univ., Lincoln.
NEW ELEMENTS FOR ANALYSIS OF SPACE FRAMES WITH TAPERED MEMBERS Ph.D. Thesis
Yong-Woo Lee 1983 204 p
Avail: Univ. Microfilms Order No. DA8314904

The closed forms of the linear stiffness matrix, geometric stiffness matrix, displacement functions and equivalent nodal loads are developed for analyses of space structures containing linearly tapered members with cross sections of thin-walled tubes, solid rectangles and I-sections. The series expansion forms of these are also developed because they avoid numerical failure in structural analyses under extremely small taper. The cross sectional properties are closely approximated by the ordering process if the geometric properties along the member do not follow a simple power law. Then, solutions are obtained by direct integration of the differential equations for displacements and the moment area theorem. The elements presented can be used for the linear stability and the large deflection analysis of tapered and prismatic members. Dissert. Abstr.

N84-14562 Virginia Polytechnic Inst. and State Univ., Blacksburg.
GEOMETRICALLY NONLINEAR ANALYSIS OF LAYERED ANISOTROPIC PLATES AND SHELLS Ph.D. Thesis
Wai-Cheng Chao 1983 86 p
Avail: Univ. Microfilms Order No. DA8316871

A degenerated three dimensional finite element based on the total Lagrangian, incremental, formulation of a three dimensional layered anisotropic medium is developed, and its use in the geometrically nonlinear, static as well as dynamic, analysis of layered composite plates and shells is demonstrated via several example problems. For comparison purposes a two dimensional finite element based on the Sanders shell theory with the von Karman (nonlinear) strains is also presented. The elements have the following features: (1) geometrically linear and nonlinear analysis; (2) static and transient analyses; (3) natural vibration (linear) analyses; (4) plates and shell elements; (5) arbitrary loading and boundary conditions; and (6) arbitrary lamination scheme and lamina properties. The element can be used, with minor changes, in any existing general purpose program. Dissert. Abstr.

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-14563* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HEAT CAPACITY MAPPING MISSION (HCMM) ANTHOLOGY
Nicholas M. Short and Locke M. Stuart, Jr., Principal Investigators 1982 268 p refs Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E84-10051; NASA-SP-465; NAS 1.21:465) Avail: SOD HC $24.00 CSCL 08B

The analysis and interpretation of thermal imagery is explained in this tutorial which reviews and evaluates a program that surveyed reflected solar radiation and thermal emission from the Earth's surface with a spatial resolution of 600 meters. For individual titles, see N84-14564 through N84-14570.

N84-14564* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTRODUCTION: HISTORICAL PERSPECTIVE ON THE HCMM PROGRAM
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 1-6 Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

When some thermal radiation sensitive devices on U.S. meteorological satellites generated low resolution images showing temperature variations on Earth's land and sea surfaces during the middle 1960's, interest was aroused in the potential of thermal sensing in geology, agriculture, soil moisture, ground water, water temperature, and vegetation applications. The concept of using the property of thermal inertia to identify materials, particularly those of a geologic nature can be traced to the same time period that marks the flight of the first LANDSAT - Spacecraft systems and their performance, and capabilities are reviewed as well as achievements in hydrology, geology, agriculture, pedology, and urban climate effects applications. A.R.H.

N84-14565* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRINCIPLES OF THERMAL REMOTE SENSING
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 7-14 refs Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

The remote sensing of temperature is performed by sensing radiation emitted from solids, liquids, and gases in the thermal infrared region of the spectrum, in which thermal emission is dominant over reflected solar energy. For Earth resources applications, thermal sensing of solids and liquids is performed in two "windows" of the atmosphere where atmospheric absorption and emission are at a minimum. Temperature measurement, intrinsic thermal properties, factors in interpreting thermal data, the use of thermal inertia, and the measurements obtained by the heat capacity mapping radiometer are discussed. A.R.H.

N84-14566* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPRETATION OF HCMM IMAGES: A REGIONAL STUDY
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 15-62 refs Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

Potential users of HCMM data, especially those with only a cursory background in thermal remote sensing are familiarized with the kinds of information contained in the images that can be extracted with some reliability solely from inspection of such standard products as those generated at NASA/GSFC and now achieved in the National Space Science Data Center. Visual analysis of photoimagery is prone to various misimpressions and outright errors brought on by unawareness of the influence of physical factors as well as by sometimes misleading tonal patterns introduced during photoprocessing. The quantitative approach, which relies on computer processing of digital HCMM data, field measurements, and integration of rigorous mathematical models, can usually be used to identify, compensate for, or correct the contributions from at least some of the natural factors and those associated with photoprocessing. Color composite, day-IR, night-IR and visible images of California and Nevada are examined. A.R.H.

N84-14567* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GALLERY OF HCMM IMAGES
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 63-168 Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

A gallery of what might be called the "Best of HCMM" imagery is presented. These 100 images, consisting mainly of Day-VIS, Day-IR, and Night-IR scenes plus a few thermal inertia images, were selected from the collection accrued in the Missions Utilization Office (Code 902) at the Goddard Space Flight Center. They were selected because of both their pictorial quality and their information or interest content. Nearly all the images are the computer processed and contrast stretched products routinely produced by the image processing facility at GSFC. Several LANDSAT images, special HCMM images made by HCMM investigators, and maps round out the input. A.R.H.

N84-14568* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIGNIFICANT RESULTS FROM THE HCMM PROGRAM
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 169-236 refs Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

The major objectives of the HCMM program for applications in geology, agriculture, water studies, and the effects of climate on metropolitan areas are summarized. Results obtained by Principal Investigators in each of these disciplines are presented, discussed, and supported with figures and tables. In order to compare the types of observations and applications that can be derived from HCMM data with some remote sensing standard or framework for each discipline, the principal results already achieved with the LANDSAT system are included. A.R.H.

N84-14569* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUMMARY AND OVERVIEW
In its The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 237-244 Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 08B

The merits, shortcomings, and future outlook of thermal IR remote sensing are appraised from a philosophical and speculative point of view in the light of the HCMM experiments. Two key questions stemming from HCMM addressed are: thermal remote sensing from space platforms now on a solid foundation in terms of demonstrated applications of real utility as well as theory, and where should NASA's research be focused in thermal remote sensing and are the potential applications sufficient to justify inclusion of thermal sensors in later generations of Earth resources satellites. A.R.H.

N84-14570* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HCMM SYSTEM: DEVELOPMENT AND PERFORMANCE
c35
Locke M. Stuart, Jr. *In its* The Heat Capacity Mapping Mission (HCMM) Anthology 1982 p 245-260 Original contains color imagery. Original imagery may be purchased from NASA. Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM (For primary document see N84-14563 05-43)
Avail: SOD HC $24.00 CSCL 14B

The structure and history of the heat capacity mapping mission program is reviewed and the spacecraft is described including engineering specifications, instrument design, data handling, and image characteristics. A.R.H.

N84-14571 Royal Netherlands Meteorological Inst., De Bilt.
HUNDRED YEARS LATER: SEPTEMBER 1883 - SEPTEMBER 1983; ANNOTATED BIBLIOGRAPHY OF THE FIRST DUTCH NORTH POLE EXPEDITION 1882-1883 [HONDRED JAAR LATER: SEPTEMBER 1883-SEPTEMBER 1983; GEANNOTEERDE BIBLIOGRAFIE VON DE EERSTE NEDERLANDSCHE NOORDPOOL EXPEDITIE 1882-1883]
Tonnie Klaassen, comp. Sep. 1983 21 p refs In DUTCH; ENGLISH summary
(KNMI-83-02) Avail: Issuing Activity

An annotated bibliography containing over 50 items concerning the 1883 Dutch North Pole expedition is presented.
Author (ESA)

N84-14572*# Johns Hopkins Univ., Baltimore, Md.
GEOID ANOMALIES AND FRACTURE ZONES IN THE PACIFIC OCEAN
[1984] 11 p ERTS
(Grant NAG5-32)
(E84-10052; NASA-CR-174581; NAS 1.26:174581) Avail: NTIS HC A02/MF A01 CSCL 08B

The high degree and order geoid field in the Pacific is a superposition of fracture zone anomalies and hot-spot swell anomalies. A two-dimensional spectral analysis of this field reveals a very strong north-south wavenumber contribution with a dominant wavelength of about 2000 km, a much smaller contribution from east-west wavenumbers, and negligible contributions from other directions. One dimensional profiles were taken in order to appreciate the magnitudes of the north-south and east-west components. A calculated geoid anomaly using an idealized fracture zone model contains just about the same amount of power in the 2350 km band wavelength as does the north-south profile of the SEASAT geoid field. In an attempt to correlate plate age with geoid anomalies, a digitized age map of the Pacific was used to generate a synthetic geoid, which was subtracted from SEASAT. This procedure produces a residual geoid in which the fracture zone anomalies appear to be diminished, if not removed. A.R.H.

N84-14573*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 SENSOR PERFORMANCE
John L. Barker and Fred J. Gunther (Computer Sciences Corp., Silver Spring, Md.) 1983 35 p refs Presented at Pecora 8 Remote Sensing Symp., Sioux Falls, S.D., 4 Oct. 1983 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-24350)
(E84-10053; NASA-TM-85459; NAS 1.15:85459) Avail: NTIS HC A03/MF A01 CSCL 14B

Preflight and in-orbit sensor and data measurements indicate that TM meets or exceeds most specifications. Measured spectral band edges meet instrument specifications in 12 out of 14 cases; there is ample dynamic range. The signal-to-noise ratio exceeds specifications, except for band 3, channel 4; and band 7 channel 7 is very noisy but still meets specifications. The modulation transfer function of channel 4, band 2, is smaller than specified. Registration errors between the primary focal plane (PFP) and the cold focal plane (CFP) are about 0.75 pixels along-scan and 0.2 pixels across scan. Forward and reverse scan discontinuities, are well within ground-processing capabilities to rectify. Instrument gain variability, up to 7% for band 5, requires use of the internal calibration (IC) system to assure radiometric accuracy. Preliminary applications evaluation of image contents indicates that TM provides much better definition of edges than MSS. A.R.H.

N84-14574*# Rochester Inst. of Tech., N. Y. Coll. of Graphic Arts and Photography.
LANDSAT 4 BAND 6 DATA EVALUATION Quarterly Report
15 Dec. 1983 4 p ERTS
(Contract NAS5-27323)
(E84-10054; NASA-CR-174582; NAS 1.26:174582; QR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

Satellite data collected over Lake Ontario were processed to observed surface temperature values. This involved computing apparent radiance values for each point where surface temperatures were known from averaged digital count values. These radiance values were then converted by using the LOWTRAN 5A atmospheric propagation model. This model was modified by incorporating a spectral response function for the LANDSAT band 6 sensors. A downwelled radiance term derived from LOWTRAN was included to account for reflected sky radiance. A blackbody equivalent source radiance was computed. Measured temperatures were plotted against the predicted temperature. The RMS error between the data sets is 0.51K. A.R.H.

N84-14575# Naval Research Lab., Washington, D. C. Ocean Dynamics Branch.
DATA VALIDATION AND SUMMARY FOR THE NRL REMOTE SENSING EXPERIMENT. PHELPS BANK, JULY 1982. PART 1: HYDROGRAPHY Interim Report
J. A. C. Kaiser 2 Sep. 1983 149 p
(RR01310441)
(AD-A132083; NRL-MR-5165) Avail: NTIS HC A07/MF A01 CSCL 08/8

During the NRL Remote Sensing Experiment in the Phelps Bank region hydrographic data were obtained with a Neil-Brown CTD (conductivity-temperature-depth) profiler and with XBT (expendable bathythermograph) probes. The data is summarized, profiled and contoured. The contoured data is corrected for tidal advection and for the temporal change during the survey. The T, S (temperature, salinity) relation for the area is highly structural indicating the effects of mixing of shelf water and deep upwelling water in the presence of surface mixed layers having origins within and without the area. GRA

N84-14576# Forschungsinstitut fuer Informationsverarbeitung, Karlsruhe (West Germany).
COINCIDENT EXTRACTION OF LINE OBJECTS FROM STEREO IMAGE PAIRS Final Technical Report, Feb. 1982 - Sep. 1983
H. Kazmierczak, M. Sties, R. Lubkowitz, and M. Bohner Sep. 1983 119 p Original contains color illustrations
(Contract DAJA37-82-C-0243; DA Proj. 1T1-61102-BH-57)
(AD-A133892; FIM-115) Avail: NTIS HC A06/MF A01 CSCL 20/6

A procedure for the automatic extraction of line objects from stereo pairs of aerial images (e.g., objects as roads, rivers, railroads and multilane highways) has been developed and implemented on a DEC VAX 11/780 computer. The procedure and its main functions are described in summary and in detail. A detailed documentation of the various test results is included as well as assessment and conclusions. GRA

N84-14577# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
ACTIVE AND PASSIVE REMOTE SENSING OF ICE Semiannual Report, 16 Feb. - 31 Jul. 1983
Jin Au Kong Aug. 1983 42 p
(Contract N00014-83-K-0258)
(AD-A133672; AD-E401078) Avail: NTIS HC A03/MF A01 CSCL 20/14

The dyadic Green's functions (DGF) for an anisotropic (tilted uniaxial) medium have been evaluated for the unbounded and the two-layered cases. Inside the uniaxial medium, there are two characteristic waves, i.e., an o-wave and and e-wave. A wave incident with either TE or TM polarization produces both TE and TM waves when it reflected at the interface of an isotropic and a uniaxially anisotropic media because of its coupling into both the o-wave and the e-wave. With the availability of the DGF for anisotropic media, many layered-medium problems can now be solved. For instance, the problem of radiating a Hertzian dipole with an arbitrary orientation on top of a two layer anisotropic medium can readily be solved. GRA

N84-14578# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
A SUMMARY OF MODELING STUDIES OF THE KRAFLA GEOTHERMAL FIELD, ICELAND
Godmundur S. Bodvarsson, Karsten Pruess, Valgardur V. Stefansson (National Energy Authority of Iceland), and Einar T. Eliasson (State Electric Power Works) Aug. 1983 10 p refs Presented at the Geothermal Resources Council Ann. Meeting, Portland, Oreg., 24-27 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-000939; LBL-16100; CONF-831041-11) Avail: NTIS HC A02/MF A01

A comprehensive modeling study of the Krafla geothermal field in Iceland has been carried out. The study consists of four tasks: the analysis of well test data, modeling of the natural state of the field, the determination of the generating capability of the field, and modeling of well performance. The results of all four tasks are consistent with field observations. DOE

N84-14579# Nevada Univ., Reno. Water Resources Center.
RELATIONSHIPS AMONG PRECIPITATION, SNOWMELT, SUBSURFACE FLOW, GROUNDWATER RECHARGE AND STREAMFLOW GENERATION IN THE CLEAR CREEK WATERSHED, EASTERN SIERRA NEVADA
R. L. Boone, M. E. Campana, and C. M. Skau Jul. 1983 126 p refs
(Contract DI-14-34-0001-9030)
(PB83-253344; PUB-41084; W83-03822; OWRT-A-089-NEV(1)) Avail: NTIS HC A07/MF A01 CSCL 08H

An understanding of hillslope hydrologic processes in the forested watersheds of the Sierra Nevada is requisite to the quantification of water quality, groundwater recharge and streamflow generation. A field study utilizing a tensionmeter-transducer network, piezometers, psychrometers and flumes was initiated in a portion of the Clear Creek watershed in the Carson Range of the Sierra Nevada. The investigation sought to examine the relationships among precipitation, snowmelt, groundwater recharge, subsurface flow and streamflow generation during the fall of 1982 and the winter of 1983 as well as provide a benchmark for future similar studies in the Sierra. GRA

N84-14580# University of South Florida, Tampa. Dept. of Geology.
EVALUATION OF A GROUND TRANSIENT ELECTROMAGNETIC REMOTE SENSING METHOD FOR THE DEEP DETECTION AND MONITORING OF SALT WATER INTERFACES
Mark T. Stewart and Michael C. Gay Jul. 1983 56 p refs
(Contract DI-34-0001-2110)
(PB83-253351; WRRC-PUB-73; W83-03899; OWRT-A-046-FLA(1)) Avail: NTIS HC A04/MF A01 CSCL 08H

A ground transient electromagnetic sounding method was evaluated for the detection of salt water-fresh water interfaces along the Gulf Coast of Florida. Seventy-nine soundings were completed utilizing either 80 by 80 meter or 160 by 160 meter horizontal transmitter coils. A 30 Hertz step function transmitter frequency was used. The decay of the vertical magnetic field was monitored over a period of 8 ms during transmitter off-time. Measurements of the rate of decay of the magnetic field were converted to produce an apparent resistivity curve for each sounding. Computer produced theoretical curves were matched to the apparent resistivity curves. GRA

N84-14581# Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
CONTINUUM MECHANICS APPROACH TO STREAMFLOW MODELING
Vijay P. Singh, Shyam N. Prasad (Louisiana State Univ.), and Lucio Ubertini (C.N.R. Inst. for Hydrogeological Protection Research in Central Italy) Jul. 1983 58 p refs
(Contract DI-14-34-0001-2120)
(PB83-265041; W83-03996; OWRT-A-058-LA(2)) Avail: NTIS HC A04/MF A01 CSCL 08H

Modeling of streamflow for a given rainfall event is surveyed. The approach proposed treats streamflow as a continuum and takes into account dynamic interactions between three modes of flow: (1) surface flow, (2) unsaturated flow, and (3) saturated flow. In this manner, two independent areas of study blend together, soil water and hydraulics of runoff. GRA

N84-14582# Environmental Research and Technology, Inc., Concord, Mass.
STUDY OF THE COMBINED USE OF DATA FROM SATELLITE THERMAL INFRARED AND MICROWAVE SENSORS FOR SOIL MOISTURE DETECTION Final Report
James C. Barnes and Leo J. Gendron Jun. 1983 85 p refs
(PB83-252734; ERT-B195F; NOAA-83082406) Avail: NTIS HC A05/MF A01 CSCL 08M

The prospect of utilizing combined data from satellite thermal infrared and microwave sensors for detecting soil moisture is investigated. Satellite data for a study area in Oklahoma for two periods, one in the spring and one in the fall, and analyzed and correlated with meteorological data and soil moisture data. The thermal infrared data used in the study are the Advanced Very High Resolution Radiometer data from the TIROS-N and NOAA-6 spacecraft; the microwave data are the Scanning Multifrequency Microwave Radiometer data from the Nimbus-7 spacecraft. Microwave emissivities calculated using estimated soil temperatures have a trend toward high values with decreased soil moisture in both study periods. Author (GRA)

N84-14162# Joint Publications Research Service, Arlington, Va.
COSMONAUTS USE NEW INSTRUMENTS FOR EARTH STUDY
A. Ivakhnov *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 13-15 Transl. into ENGLISH from Izv. (Moscow), 18 Jul. 1983 p 2 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

N84-14167# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING OF THE EARTH AND AGRICULTURE
G. I. Belchanskiy *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 87-95 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 3, May. - Jun. 1983 p 27-32 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-14583* National Aeronautics and Space Administration. Pasadena Office, Calif.
PRESSURE LETDOWN METHOD AND DEVICE FOR COAL CONVERSION SYSTEMS Patent
James M. Kendal (JPL, California Inst. of Tech., Pasadena) and John V. Walsh, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 6 Dec. 1983 9 p Filed 30 Apr. 1981 Supersedes N81-33306 (19 - 24, p 3313) Sponsored by NASA
(NASA-Case-NPO-15100-1; US-Patent-4,418,722;
US-Patent-Appl-SN-259211; US-Patent-Class-138-42;
US-Patent-Class-251-127;) Avail: US Patent and Trademark Office CSCL 10A

In combination with a reactor for a coal utilization system, a pressure letdown device accepts from a reactor, a polyphase fluid at an entrance pressure and an entrance velocity, and discharges the fluid from the device at a discharge pressure substantially lower than the entrance pressure and at a discharge temperature and a discharge velocity substantially equal to the entrance temperature and entrance velocity. The device is characterized by a series of pressure letdown stages including several symmetrical baffles, disposed in coaxially nested alignment. In each baffle several ports or apertures of uniform dimensions are defined. The number of ports or apertures for each baffle plate is unique with respect to the number of ports or apertures defined in each of the other baffles. The mass rate of flow for each port is a function of the area of the port, the pressure of the fluid as applied to the port, and a common pressure ratio established across the ports.
Official Gazette of the U.S. Patent and Trademark Office

N84-14584 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
THIN-LAYER SOLAR CELLS MADE OF AMORPHOUS SILICON [DUENNSCHICHT-SOLARZELLEN AUS AMORPHEM SILIZIUM]
G. Mueller and G. Winterling 17 Oct. 1982 14 p refs In GERMAN Presented at Bundesministerium fuer Forsch. u. Technol. (BMFT) Statussem., 15-17 Oct. 1982
(MBB-UA-664-82-Oe) Copyright. Avail: Issuing Activity

Amorphous silicon (a-Si) cells with p-i-n structure and high efficiency were developed for decentralized applications. The Si-layers are separated by decomposition of SiH4 in an RF glow discharge in a capacitively coupled stainless steel reactor. The surface structure, investigated with an optical microscope and a raster electron microscope, is granular. The chemical composition was determined with an Auger electron spectrometer. A clear improvement of the a-Si material is found. The dark-capacitance of a p-i-n diode is nearly frequency independent between 10Hz and 1MHz. Layers doped with B for solar cells show a dark-conduct which is three orders of magnitude higher than that a pure

a-Si-layers, and ensuing reduced activities. The measured open circuit voltage of the p-i-n structure as a function of temperature is clearly lower than that of the n-i-p structure, while the fill factor is also lower. The efficiency of cells with a surface of 0.07 and 1.00 sacm is found to within 7% and 6% respectively.
Author (ESA)

N84-14585*# Chronos Research Labs., Inc., Olivehain, Calif.
PYROELECTRIC CONVERSION IN SPACE: A CONCEPTUAL DESIGN STUDY Final Report, 21 Sep. 1982 - 20 Sep. 1983
R. B. Olsen Sep. 1983 78 p refs
(Contract NAS3-23052)
(NASA-CR-168272; NAS 1.26:168272) Avail: NTIS HC A05/MF A01 CSCL 10A

Pyroelectric conversion is potentially a very lightweight means of providing electrical power generation in space. Two conceptualized systems approaches for the direct conversion of heat (from sunlight) into electrical energy using the pyroelectric effect of a new class of polar polymers were evaluated. Both of the approaches involved large area thin sheets of plastic which are thermally cycled by radiative input and output of thermal energy. The systems studied are expected to eventually achieve efficiencies of the order of 8% and may deliver as much as one half kilowatt per kilogram. In addition to potentially very high specific power, the pyroelectric conversion approaches outlined appear to offer low cost per watt in the form of an easily deployed, flexible, strong, electrically "self-healing", and high voltage sheet. This study assessed several potential problems such as plasma interactions and radiation degradation and suggests approaches to overcome them. The fundamental technological issues for space pyroelectric conversion are: (1) demonstration of the conversion cycle with the proposed class of polymers, (2) achievement of improved dielectric strength of the material, (3) demonstration of acceptable plasma power losses for low altitude, and (4) establishment of reasonable lifetime for the pyroelectric material in the space environment. Recommendations include an experimental demonstration of the pyroelectric conversion cycle followed by studies to improve the dielectric strength of the polymer and basic studies to discover additional pyroelectric materials. Author

N84-14586*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USE OF THE WEST-1 WIND TURBINE SIMULATOR TO PREDICT BLADE FATIGUE LOAD DISTRIBUTION
David C. Janetzke 1983 13 p refs Presented at the 6th Bien. Wind Energy Conf. and Workshop, Minneapolis, 1-3 Jun. 1983
(Contract DE-AI01-76ET-20320)
(NASA-TM-83532; E-1898; NASA/DOE/20320-56; NAS 1.15:83532) Avail: NTIS HC A02/MF A01 CSCL 10A

To test the ability of WEST-1 to predict blade fatigue load distribution, actual wind signals were fed into the simulator and the response data were recorded and processed in the same manner as actual wind turbine data. The WEST-1 simulator was operated in a stable, unattended mode for six hours. The probability distribution of the cyclic flatwise bending moment for the blade was comparable to that for an actual wind turbine in winds with low turbulence. The input from a stationary anemometer was found to be inadequate for use in the prediction of fatigue load distribution for blade design purposes and modifications are necessary.
Author

N84-14587*# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ASSESSMENT OF INSTITUTIONAL BARRIERS TO THE USE OF NATURAL GAS FUEL IN AUTOMOTIVE VEHICLE FLEETS Final Report
Jan Jablonski, Linda Lent, Michael Lawrence, and Leslie White (Safety Sciences, Inc., Washington, D.C.) Aug. 1983 90 p refs
(Contracts DEN3-295; DE-AI01-81CS-50006)
(NASA-CR-168183; DOE/NASA-0295/1; NAS 1.26:168183; JACKFAU-83-302) Avail: NTIS HC A05/MF A01 CSCL 21D

Institutional barriers to the use of natural gas as a fuel for motor vehicle fleets were identified. Recommendations for barrier removal were developed. Eight types of institutional barriers were assessed: (1) lack of a national standard for the safe design and certification of natural gas vehicles and refueling stations; (2) excessively conservative or misapplied state and local regulations, including bridge and tunnel restrictions, restrictions on types of vehicles that may be fueled by natural gas, zoning regulations that prohibit operation of refueling stations, parking restrictions, application of LPG standards to LNG vehicles, and unintentionally unsafe vehicle or refueling station requirements; (3) need for clarification of EPA's tampering enforcement policy; (4) the U.S. hydrocarbon standard; (5) uncertainty concerning state utility commission jurisdiction; (6) sale for resale prohibitions imposed by natural gas utility companies or state utility commissions; (7) uncertainty of the effects of conversions to natural gas on vehicle manufactures warranties; and (8) need for a natural gas to gasoline equivalent units conversion factor for use in calculation of state road use taxes. E.A.K.

N84-14588# Institute of Gas Technology, Chicago, Ill.
USAF ADVANCED TERRESTRIAL ENERGY STUDY. VOLUME 1: PROJECT SUMMARY Final Report, Sep. 1980 - Feb. 1982
E. J. Daniels, B. D. Yudow, and T. D. Donakowski Wright-Patterson AFB, Ohio AFWAL Apr. 1983 66 p
(Contract F33615-80-C-2041; AF Proj. 3145)
(AD-A133803; Rept-61045-Vol-1; AFWAL-TR-82-2019-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 10/1

The objective of this project was to develop a data base of technical and economic performance parameters of selected energy conversion and energy storage devices. The data base includes not only the state-of-the-art (1980) values of performance parameters, but also the expected values of performance parameters in 1985, 1990, and 2000. For energy conversion technologies, performance parameters were developed over a power output from 1.5 to 5000.0 kW. For energy storage technologies, performance parameters were developed over an energy output range equivalent to the power output at continuous annual operation. The following energy conversion technologies were characterized in this data base: Gas turbines -- Closed cycle and Open cycle, (recuperative and nonrecuperative); Diesels -- Turbocompounded, Turbocharged and Adiabatic; Stirlings -- Free piston and Kinematic; Organic Rankine Cycles; Fuel cells -Phosphoric acid, Solid polymer electrolyte and Molten carbonate; Photovoltaics -- Flat plate, Actively cooled and Photochemical; and Wind turbines -- Vertical and horizontal axes. The following energy storage technologies were characterized: Batteries -- Zn/Cl2, Zn/Br2, Ni/Fe, Li-Al/FeS2, Na/S, Advanced sealed lead/acids and Redox Cr-Fe; and Thermal energy storage devices -- CaCl26H2O, Na2SO410H2O, Na2S2O35H2O, Olivine and Magnesite ceramic brick, and Form-stable polyethylene. GRA

N84-14589# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE US DEPARTMENT OF ENERGY PHOTOVOLTAICS PROGRAM ANNUAL REVIEW
1983 298 p Proc. held in Arlington, Va., 15-16 Feb. 1983 Prepared in cooperation with Midwest Research Inst., Golden, Colo.
(Contract DE-AM03-76SF-00767)
(DE83-010325; CONF-830222) Avail: NTIS HC A13/MF A01

One paper was separately abstracted and 19 brief summaries of presentations given at this meeting were indexed. Also included in the proceedings but not indexed are introductory speeches and presentations consisting of viewgraphs only. DOE

N84-14590# Marburg Univ. (West Germany). Arbeitsgruppe Halbleiter.
ELECTRONIC PROPERTIES OF AMORPHOUS SILICON (a-Si:H) Final Report, Jul. 1981
Walter Fuhs Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-154; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

Electronic properties of amorphous silicon films were investigated by measurements of conductivity and thermoelectric power, field effect and electron spin resonance (ESR). The films were prepared by decomposition of silane and silane-germane-mixtures in an RF glow discharge. Density of localized gap states was investigated by field effect and ESR. Defect states near midgap were created by light exposure which probably lead to fluctuations of potential. It is shown that doping also introduces defect states. Schottky barriers on n-type and p-type a-Si:H were characterized by measurements of current voltage characteristics and capacity. The photocurrents were studied in forward and reverse direction. This gives information about the spectral dependence of the absorption coefficient at low photon energy. Author (ESA)

N84-14591# Technische Hochschule, Aachen (West Germany). Inst. for Aerospace Engineering.
WIND ENERGY CONCENTRATION WITHIN VORTEX FLOW FIELDS AND ITS UTILIZATION FOR THE GENERATION OF ENERGY, PHASE 1 Final Report, Dec. 1981
Eberhard Greff and Dieter Holsdeppe Bonn Bundesministerium fuer Forschung und Technologie Aug. 1983 212 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-157; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38

Delta-shaped planforms serving as vortex generators were investigated in a water tunnel where vortex stabilization by spanwise camber was achieved. The velocity field of an optimized wing was measured in a wind tunnel with a five hole probe. Codes for rotor blade design in flows with swirl were derived and a threefold optimum solidity was found. Power measurements on a four blade rotor show an upper limit of loading at a power amplification ratio of two. Author (ESA)

N84-14592# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM FOR PHOTOVOLTAIC RESIDENCES IN THE SOUTHWEST Final Report
E. M. Mehalick Apr. 1982 120 p refs
(Contract DE-AC02-76ET-20279)
(DE82-016271; DOE/ET-20279/193) Avail: NTIS HC A06/MF A01

A photovoltaic system was designed and integrated into a residential home suitable for the Southwest. The system is grid connected and is designed to meet both space conditioning requirements and all conventional electrical load requirements for an all electric residence. The installation of the modules was completed as planned. Author

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-14593# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
AIR MONITORING TECHNIQUES FOR SPACE SHUTTLE LAUNCHES VANDENBERG AIR FORCE BASE Final Report, Dec. 1981 - Jun. 1983
Gerald D. Swoboda and Dennis F. Naugle Jul. 1983 28 p
(AD-A132956; OEHL-83-217EQ195GEF) Avail: NTIS HC A03/MF A01 CSCL 13/2

Space Transportation System (STS) launches at Kennedy Space Center (KSC), Florida have produced a wide range of environmental phenomena. These phenomena have included far field hydrogen chloride (HC1) acid rainout and near field HCl gas revolatilization. The U.S. Air Force and the National Aeronautics and Space Administration (NASA) have conducted detailed scientific field and laboratory studies to define the effects of exhaust effluents produced during Space Shuttle launches. Inferences can be drawn from the monitoring studies at KSC and applied to the first STS launch at Vandenberg AFB (VAFB). There are, however, significant differences in launch scenarios between KSC and VAFB that could alter or produce different environmental effects. These differences include terrain, meteorology, flame trench configuration, deluge water and vehicle configuration. These differences may produce unforeseen environmental effects during STS launches at VAFB and for this reason, a comprehensive monitoring program should be considered. This report recommends a monitoring program methodology which includes ground monitoring, aircraft monitoring and remote sensing for STS launches at VAFB. GRA

N84-14594# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
USAF SPACE SHUTTLE DISPERSION MODELLING Final Report, Mar. 1982 - Mar. 1983
Dennis F. Naugle and Gerald D. Swoboda Mar. 1983 23 p
(AD-A132957; OEHL-83-116EA195CDA) Avail: NTIS HC A02/MF A01 CSCL 16/4

The Space Shuttle emits large quantities of hydrogen chloride (HCl) to the atmosphere during launch. The fate of the HCl is not well understood but includes ground deposition near the launch pad, acid washout, acid rainout, and gaseous HCl dispersion. A workshop was held at the USAF OEHL on 30 Nov to 2 Dec 1982 to discuss this phenomena and how to predict the effects which will occur during future Shuttle launches from Vandenberg AFB CA. Predictive dispersion model alternatives are presented. Recommendations include: (1) Adapt the NASA model for VAFB operational use. (2) Continue work on more sophisticated models for risk assessments and to improve or eventually replace the simpler operational model. (3) Collect essential measurement data to evaluate and improve models, and (4) For a steering committee to help insure an adequate predictive technique is operational for the first Shuttle launch from VAFB. GRA

N84-14595# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
STS-5 (SPACE TRANSPORT SYSTEM-5) FISH KILL, KENNEDY SPACE CENTER, FLORIDA Final Report
Joseph E. Milligan and Gene B. Hubbard Jan. 1983 28 p
(AD-A132958; OEHL-83-096EE003AFA) Avail: NTIS HC A03/MF A01 CSCL 13/2

Since fish kills were observed following previous Space Transport System (STS) launches, the USAF Occupational and Environmental Health Laboratory was requested to conduct an on-site investigation of any possible fish kill associated with STS-5 on 11 November 1982. Due to the acuteness of the fish kills and close association with time of launch, STS exhaust products, such as HC1 and/or aluminum oxide were suspected as the cause. Other potential causes considered included diseases, parasites, mechanical interference with respiration, insufficient oxygen, trauma, temperature and pH changes, and exposure to other toxic substances. The conclusion was that the fish died from ionic imbalances and fatal anoxia resulting from severe gill damage caused by a rapid decrease in the water pH. The change in water pH was a transitory phenomenon and not perceived to be a long-term environmental threat. GRA

N84-14596# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
RAMAN STUDY OF GRAPHITIC-CARBON CONCENTRATIONS IN THE WESTERN ARCTIC
H. Rosen and T. Novakov Aug. 1983 10 p refs
(Contract DE-AC03-76SF-00098; Grant NA81RA-G-00254)
(DE84-001090; LBL-16473) Avail: NTIS HC A02/MF A01

Direct substantiation of combustion generated particles in the Arctic atmosphere has been provided by the identification of large concentrations of graphite carbon particles at the NOAA-GMCC observatory near Barrow, Alaska. An extension of these studies of carbon particles to the Canadian and the Norwegian arctic is reported. These studies, using the Raman scattering technique, identify substantial concentrations of graphitic carbon particles at ground level stations throughout the western Arctic. These results show that the large concentrations of graphitic particles found at Barrow are not a local phenomenon but are characteristic of ground level stations throughout the western Arctic. DOE

N84-14597# Brookhaven National Lab., Upton, N. Y. Environmental Chemistry Div.
ATOMOSPHERIC STUDIES PERTAINING TO SULFUR IN THE ENVIRONMENT
Leonard Newman 1983 23 p refs Presented at the Intern. Workshop on Stable Isotopes in the Assessment of Natural and Anthropogenic Sulfur in the Environment, Pushchino, USSR, 9-16 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-001455; BNL-33733; CONF-8309150-2) Avail: NTIS HC A02/MF A01

The atmospheric sulfur cycle and the chemistry pertaining thereto are discussed. Also presented is information on the variation and the use of isotopic variations of sulfur compounds that have been reported upon in the literature. Finally, some consideration is given to the potential for the use of enriched sulfur to study transport and transformation. DOE

N84-14598# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
RADIOACTIVITY LEVELS IN HUMID AND DRY FALLOUT GATHERED IN THE LAST 20 YEARS IN SOME POINTS OF THE PADANA VALLEY (ITALY) [ANDAMENTO DEI LIVELLI DI RADIOATTIVITA NELLE RICADUTE UMIDE E SECCHE RACCOLTE NEGLI ULTIMA 20 ANNI IN ALCUNI PUNTI DELLA VALLE PADANA: DISCUSSIONE E CONFRONTI]
G. Bonfanti and S. Albertazzi (Parma Univ., Italy) 1983 24 p refs In ITALIAN Presented at 3rd Conv. Nazl. di Radioecologia, Bologna, 22-23 Jun. 1983
(CISE-2069) Avail: NTIS HC A03/MF A01

The levels of radioactive fallout in the localities of Milano-Segrate, Ispra and Parma for the last 20 years are compared, particularly for the longer life isotopes such as Cs 137 and Sr 90. It is concluded that the distribution of fallout is correlated to the radionuclei introduced in the atmosphere by nuclear explosions and transported mainly by atmospheric precipitation. Few stations are required to reconstruct the general distribution of radioactive fallout in much greater part of the territory. Author (ESA)

N84-14599# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
THE CENTRO INFORMAZIONI STUDI ESPERIENZE (CISE) ACTIVITY IN BACKGROUND RADIOACTIVITY [LE ATTIVITA DEL CISE NEL CAMPO DELLA RADIOATTIVITA AMBIENTALE]
E. Bazzano 1983 10 p In ITALIAN Presented at 3rd Conv. Nazl. di Radiocologia, Bologna, 22-23 Jun. 1983
(CISE-2070) Avail: NTIS HC A02/MF A01

Monitoring of nuclear power plant sites, long period environmental impact studies, laboratory simulation of ambient radio chemistry, direct characterization of physical and chemical forms of radionuclei in natural waters, development of mathematical models, concentration methods for extraction of radionuclei, and techniques for direct field measurements of radioactivity are discussed. Author (ESA)

N84-14600# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
SEDIMENT RADIOACTIVITY IN THE STRETCH OF THE PO RIVER FROM MONTE TRINO TO VALLE CAORSO: SOME RESULTS FOR THE PERIOD 1978-82 [LA RADIOATTIVITA NEI SEDIMENT DEL TRATTO DI FIUME PO DA MONTE TRINO A VALLE CAORSO: ALCUNI RISULTATI RELATIVI AL PERIODO 1978-82]
R. Artioli and A. L. Traversi 1983 29 p In ITALIAN Presented at 3rd Conv. Nazl. di Radioecologia, Bologna, 22-23 Jun. 1983 Sponsored by Ente Nazionale per l'Energia Electicca (ENEL)
(CISE-2071) Avail: NTIS HC A03/MF A01

Spatial and temporal variations, identification of accumulation periods and regions, and the existance of self-cleaning processes of long life radioactive nuclei in a river were studied. A high correlation is found between U and Th families, and between Cs 137, and Co 60, and between these and the apparent density of the sediment. Lower density sediments show a greater capacity of radioactivity accumulation. In 1979 a sudden accumulation of Cs 137 and Co 60 followed by a fast self depuration is noted. A limit value of the river regime, above which a self depuration process starts, exists. Author (ESA)

N84-14601# Gesamthochschule, Kassel (West Germany). Fachbereich Wirtschaftswissenschaften.
AIR POLLUTION, ENVIRONMENTAL POLICY, AND ECONOMICS IN THE FEDERAL REPUBLIC OF GERMANY
Ulrich Hampicke Jan. 1983 28 p refs
(GhK-07) Avail: NTIS HC A03/MF A01

Emission of major pollutants, air quality, and the effects of air pollution on man, animals and buildings in West Germany since the 1974 clean air act are discussed. Air pollution and microeconomic theory is considered. Efforts at reducing emissions are less successful than they used to be. Some substances (e.g., NOx) even show a marked increase. This is true not only for emissions measured in absolute terms, but also in relation to fossil fuel input (specific emissions). Emissions of major pollutants in urban and industrial areas have steadily decreased, while there is a slight upward trend in rural air pollution. Federal air quality standards are in general met, but inferences as to human exposure to air pollution are difficult. Author (ESA)

N84-14602# Transportation Research Board, Washington, D.C.
ATMOSPHERIC EMERGENCIES: EXISTING CAPABILITIES AND FUTURE NEEDS
Al J. Smith, Jr., H. D. vanCleave, Ronald Y. Wada, Brenner Munger, and Paul Hurt 1983 48 p
(PB83-250779; TRB/TRR-902; ISBN-0-309-03516-3; ISSN-0361-1981; LC-83-13464) Avail: NTIS HC A03/MF A01; also available in hard copy from Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418 CSCL 13B

The following areas are covered: environmental emergencies: preparing for critical hours; national overview of emergency response under superfund; atmospheric problems from hazardous materials spills in San Francisco bay area; integrated modeling of the release and dispersion of hazardous gases in the atmosphere; U.S. Air Force air weather service methodologies for calculating toxic corridors; calculation of evacuation distances during toxic air pollution incidents; toxic corridor prediction programs; toxic corridor projection models for emergency response; radiation hazards analysis in transport of low specific activity waste material; aerometric instrumentation for real-time monitoring at hazardous spill sites: overview of needs and resources; and, applications of remote sensing to hazardous spill incidents. GRA

N84-14603# California Univ., Santa Barbara. Marine Science Inst.
ASSESSMENT OF ACIDITY OF LAKES AND PRECIPITATION IN THE SIERRA NEVADA
J. M. Melack Jul. 1983 66 p refs
(PB83-255521; S83-03911; OWRT-A-080-CAL(1)) Avail: NTIS HC A04/MF A01 CSCL 13B

The east central Sierra Nevada received acid precipitation (pH 3.7 to 4.9) during the convective storms interspersed through the dry seasons of 1981 and 1982. In contrast, late autumn, winter and early spring snow (1981-82) ranged in pH from 5.2 to 6.1 (mean 5.7) and had low ammonium, nitrate and sulfate concentrations. As of 1981 most of the alpine lakes of the Sierra Nevada remain very weakly buffered, bicarbonate lakes that receive a small loading of acid precipitation and a large annual input of snowmelt uncontaminated by strong acids. These lakes contain low concentrations of orthophosphate, nitrate and ammonium and are oligotrophic. The zooplankton communities fall into two major groups, those dominated by large-bodied species in the absence of fish, and those dominated by smaller species where fish are present. Author (GRA)

N84-14604 Colorado State Univ., Fort Collins.
THE EFFECTS OF LONG-RANGE TRANSPORT OF AIR POLLUTANTS ON ARTIC CLOUD-ACTIVE AEROSOL Ph.D. Thesis
Randolph Dean Borys 1983 328 p
Avail: Univ. Microfilms Order No. DA8317783

Arctic Haze, observed over much of the Arctic during winter, consists of submicron primary and secondary pollutant aerosol particles transported from mid-latitude source regions. A series of field experiments were conducted at several arctic locations to determine the relationship between cloud condensation nuclei (CCN) and ice nuclei (IN) concentrations and the concentrations of pollutant aerosol. The trace elemental composition of the total aerosol was used to determine when anthropogenic aerosol was present. Variations of the elemental composition of the aerosol and concentrations of the cloud-active aerosol (CCN and IN) were compared. This was done both between seasons and on a day-to-day basis. The results were used to determine the differences between the nucleational properties of Arctic Haze aerosol, which is pollution derived, and the natural background aerosol of the Arctic. Results show the CCN concentrations are positively correlated with the pollutant aerosol concentration on both a daily and seasonal basis. Dissert. Abstr.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-14605 Rice Univ., Houston, Tex.
HIGH LATITUDE FIELD ALIGNED CURRENTS Ph.D. Thesis
Janice Lee Karty 1983 174 p
Avail: Univ. Microfilms Order No. DA8314944

Horizontal ionospheric conduction currents are driven by magnetic field aligned currents generated in the Earth's magnetosphere. Traditional ideas about field aligned currents imply that most of the higher latitude set of field aligned (region-1 Birkeland) current flows on field lines that connect to antisunward flowing magnetospheric plasma. This conclusion disagrees with recent satellite data, and that disagreement provides a major motivation for this thesis. This research includes a stability analysis that is based on current conservation, which implies that field aligned current is balanced by the divergence of ionospheric current. This stability analysis demonstrates that there may be a sector, within the plasma sheet in the nightside magnetosphere, where plasma pressures are reduced relative to the surrounding regions. In order to simulate this depleted region, several computer experiments have been performed, enforcing gradients in plasma content at the tailward boundary of the calculation. Dissert. Abstr.

N84-14606*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE EXHAUST CLOUD PROPERTIES
B. J. Anderson and V. W. Keller Dec. 1983 117 p refs
(NASA-TP-2258; NAS 1.60:2258) Avail: NTIS HC A06/MF A01 CSCL 04A

A data base describing the properties of the exhaust cloud produced by the launch of the Space Transportation System and the acidic fallout observed after each of the first four launches was assembled from a series of ground and aircraft based measurements made during the launches of STS 2, 3, and 4. Additional data were obtained from ground-based measurements during firings of the 6.4 percent model of the Solid Rocket Booster at the Marshall Center. Analysis indicates that the acidic fallout is produced by atomization of the deluge water spray by the rocket exhaust on the pad followed by rapid scavening of hydrogen chloride gas aluminum oxide particles from the Solid Rocket Boosters. The atomized spray is carried aloft by updrafts created by the hot exhaust and deposited down wind. Aircraft measurements in the STS-3 ground cloud showed an insignificant number of ice nuclei. Although no measurements were made in the column cloud, the possibility of inadvertent weather modification caused by the interaction of ice nuclei with natural clouds appears remote. Author

N84-14607*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
IO: ESCAPE AND IONIZATION OF ATMOSPHERIC GASES Interim Report, 15 Apr. - 15 Oct. 1983
William H. Smyth Dec. 1983 10 p refs
(Contract NASw-3503)
(NASA-CR-174580; NAS 1.26:174580) Avail: NTIS HC A02/MF A01 CSCL 04A

The partitioning of the major ion densities throughout the torus is described. This description is required as input information for the Io oxygen and sulfur cloud models. In the radial interval from 4.9 to 5.4 Rj ion partitioning information is used to initially explore that impact of charge exchange reactions between the neutral gas clouds and the plasma torus ions. Because of the spatial distribution of torus ions, these reactions may be able to introduce a magnetic longitudinal effect in the plasma torus properties. Modeling efforts for the Io oxygen and sulfur clouds and for the sodium cloud data are also discussed. E.A.K.

N84-14608*# National Aeronautics and Space Administration, Washington, D. C.
REPORT ON NEW CALCULATIONS OF THE MAGNETIC POTENTIAL OF THE EARTH
Adolf Schmidt Mar. 1983 69 p Transl. into ENGLISH from Abh. der Konigl. Bayerischen Akad. der Wiss. (West Germany), v. 19, sect. 1, 1895 p 1-66 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77329; NAS 1.15:77329) Avail: NTIS HC A04/MF A01 CSCL 08N

A procedure to establish better agreement between theoretical and calculated values of the magnetic potential of the Earth is discussed. Author

N84-14609*# Scientific Translation Service, Santa Barbara, Calif.
ON THE ANALYTICAL FORM OF THE EARTH'S MAGNETIC ATTRACTION EXPRESSED AS A FUNCTION OF TIME
V. Carlheim-Gyllenskold May 1983 58 p refs Transl. into ENGLISH of "Sur la Forme Analytic de L'Attraction Magnetique de la Terre Exprimee en Fonction du Temps" (Stockholm), Kungl, Baktryckerikt, P. A. Norstedt and Soner, 1896 p 1-36
(Contract NASw-3542)
(NASA-TM-77344; NAS 1.15:77344) Avail: NTIS HC A04/MF A01 CSCL 08N

An attempt is made to express the Earth's magnetic attraction in simple analytical form using observations during the 16th to 19th centuries. Observations of the magnetic inclination in the 16th and 17th centuries are discussed. Author

N84-14610# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.
AN EXPERIMENTAL DEVICE FOR REAL TIME DETERMINATION OF SLANT PATH ATMOSPHERIC CONTRAST TRANSMITTANCE (PROTOTYPE STATUS) Final Report, 1 Jun. 1981 - 31 Dec. 1982
Richard W. Johnson 31 Jan. 1983 21 p
(Contract F19628-81-K-0023; AF Proj. ILIR)
(AD-A134000; SIO-83-14; AFGL-TR-83-0053) Avail: NTIS HC A02/MF A01 CSCL 04/1

This Final Report summarizes the development status of a simple yet relatively smart electro-optical system that has been devised to do real-time monitoring of the optical state of the atmosphere. The system concept has been built around three solid state, no moving parts, transducer assemblies interfaced with a small dedicated microprocessor that can control the system in either a semi-automatic, or an operator interactive mode. The development status at the conclusion of this shortened contract interval is such that; (1) each of the system sub-assemblies has been evaluated in a operational mock-up configuration, (2) each has performed adequately to indicate technical feasibility, and (3) the miniaturized nephelometer and on-board computer systems have been developed and fabricated to the prototype hardware stage. GRA

N84-14611# California Univ., Los Angeles. Space Science Center.
COMMUNICATIONS MAGNETOSPHERIC SUBSTORMS Final Report
R. L. McPherron 17 Jan. 1983 46 p
(Contract N00014-75-C-0396; RR02101)
(AD-A133898) Avail: NTIS HC A03/MF A01 CSCL 04/1

The primary activity of the U. of C.'s Space Science Group is the study of magnetic field measurements made by fluxgate magnetometers on spacecraft in the magnetosphere, in the solar wind and in space around other planets. Topics include: the solar wind and its internal structure; the solar wind interaction with planetary bodies; structure and dynamics of planetary magnetic fields; quantitative models of planetary fields and current systems; origins of magnetic activity; sources and properties of Ultra Low Frequency Waves; and effects of tectonic stress on rock magnetism. The faculty and research staff Group have collectively published more than 400 papers during 15 years of active involvement in the space program. ONR sponsored research has covered several subtopics within the general area of solar-terrestrial physics. These include: solar wind controlled dayside magnetic pulsations; substorm associated magnetic pulsations; magnetic storms, and magnetospheric substorms. The primary goal of this research is to understand the sequence of physical processes through which energy is transferred from the solar wind to the magnetosphere, and ultimately to the Earth's atmosphere. One approach is the study of magnetic perturbations, within the magnetosphere and on the ground, caused by changes in the solar wind. GRA

N84-14612# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
THE 27TH AFOSR (AIR FORCE OFFICE OF SCIENTIFIC RESEARCH) CHEMICAL AND ATMOSPHERIC SCIENCES PROGRAM REVIEW (27TH)
William G. Thorpe, Lee E. Myers, and Iris M. Cross 1 Jun. 1983 171 p
(AF Proj. 2303; AF Proj. 2310)
(AD-A133718; AFOSR-83-0569TR) Avail: NTIS HC A08/MF A01 CSCL 05/1

A review is presented of research efforts sponsored by the Directorate of Chemical and Atmospheric Sciences which have completed their period of support. Illustrated accounts resulting from the basic research programs in the Atmospheric and Chemical Sciences are highlighted. The Atmospheric Sciences is concerned with meteorology and upper atmospheric structure and dynamics. The meteorology focuses on mesoscale meteorology, cloud physics, and atmospheric dynamics. The Chemical Sciences deal with Chemical Techniques, Chemical Structures, Surface Chemistry, Chemical Dynamics, and Synthesis and Properties of Materials. GRA

N84-14613# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
THE CONVERSION OF OFF-VERTICAL OBSERVATIONS OF TOTAL ELECTRON CONTENT INTO EQUIVALENT VERTICAL-INCIDENCE VALUES Interim Scientific Report
Leo F. McNamara 6 Apr. 1983 41 p
(DA Proj. 4643)
(AD-A132624; AFGL-TR-83-0092; AFGL-ERP-832) Avail: NTIS HC A03/MF A01 CSCL 04/1

Observations of total electron content along off-vertical paths are normally converted into an equivalent vertical incidence total content before their application in studies of the ionosphere or in communications predictions. The errors in this conversion have been studied using a numerical model of the ionosphere. The errors are found to vary with the azimuth and elevation of the satellite, the altitude at which the conversion is made, the presence of ionospheric gradients along the ground-satellite path, and with the well-known variations of the ionosphere itself. For elevation angles of 20 deg or greater, the relative errors are usually less than about 10% and often less than about 5%, for a wide range of conditions. Errors of up to 20% are obtained for equatorial stations and for stations near the high latitude trough, especially for low angles of elevation. Author (GRA)

N84-14614# Massachusetts Inst. of Tech., Cambridge. Nuclear Reactor Lab.
DEVELOPMENT OF ANALYTICAL METHODOLOGY FOR THE MEASUREMENT OF CHLORINE AND BROMINE IN THE STRATOSPHERE Final Report, 20 Nov. 1980 - 20 Nov. 1982
Morteza Janghorbani Hanscom AFB, Mass. AFGL May 1983 19 p
(Contract F19628-81-K-0013; AF Proj. 6687)
(AD-A132640; AFGL-TR-83-0142) Avail: NTIS HC A02/MF A01 CSCL 04/1

Suitable methodology based on neutron activation analysis is developed for accurate measurement of chlorine and bromine from balloon flight sampling. The method is applied to measurement of a number of filter and filter extracts. It is shown that analyses carried out on total filter is inaccurate because of the relatively major filter bank contributions. However, analyses carried out on water extracts of filters appear to yield satisfactory measurements. Author (GRA)

N84-14615# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
A STUDY OF PLASMASPHERIC DENSITY DISTRIBUTIONS FOR DIFFUSIVE EQUILIBRIUM CONDITIONS
Wenxiu Li (Univ. of Science and Technology of China), J. J. Sojka, and W. J. Raitt Hanscom AFB, Mass. AFGL Mar. 1983 45 p
(Contract F19628-83-K-0001; AF Proj. 2311)
(AD-A132643; AFGL-TR-83-0088; SR-1) Avail: NTIS HC A03/MF A01 CSCL 04/1

We have modelled the plasmaspheric density distribution for a range of solar cycle, seasonal and diurnal conditions with a magnetic flux tube dependent diffusion equilibrium model by using experimentally determined values of ionospheric parameters at 675 km as boundary conditions. Data is presented in terms of plasmaspheric H(+) and He(+) density contours, total flux tube content and equatorial plasma density for a range of L-values from 1.15 to 3.0. The variation of equatorial density with L-value shows good agreement with the 1/L to the 4th power dependence observed experimentally. The results show that the model predicts larger solar cycle and diurnal variation in equatorial plasma density than observed using whistler techniques. However, the whistler method requires a model to deduce the equatorial density and is therefore open to interpretation. Seasonal variations are rather artificial since in this general model we have not attempted to match equatorial densities for flux tubes emanating from the winter and summer hemispheres. Author (GRA)

N84-14616# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
STUDY TO SYNTHESIZE AND INTERPRET DATA FROM SEVERAL SATELLITES AND GROUND MAGNETOMETERS Final Report, 1 Jan. 1980 - 31 Dec. 1982
R. A. Wolf 3 May 1983 77 p
(Contract F19628-80-C-0009; AF Proj. 2311)
(AD-A132670; AFGL-TR-83-0128) Avail: NTIS HC A05/MF A01 CSCL 08/14

The objective of the work has been to study convective plasma motion in the Earth's magnetosphere-ionosphere system during magnetic storms and substorms. Using the Rice Convection Model, multiple simulations have been performed for several well-observed events. Model predictions have been compared with observational data, and the computer model has been improved in several respects. GRA

N84-14617# Air Force Geophysics Lab., Hanscom AFB, Mass.
SYSTEMATICS OF THE EQUATORWARD DIFFUSE AURORAL BOUNDARY
M. S. Gussenhoven (Boston Coll., Chestnut Hill, Mass.), D. A. Hardy, and N. Heinemann (Boston Coll., Chestnut Hill, Mass.) 8 Aug. 1983 19 p Repr. from J. of Geophysical Research, v. 88, no. A7, 1 Jul. 1983 p 5692-5706
(AF Proj. 2311)
(AD-A132897; AFGL-TR-83-0186) Avail: NTIS HC A02/MF A01 CSCL 04/1

Precipitating electron data are used to determine statistically the systematic variations of the equatorward diffuse auroral boundary with K as a function of local time. This work extends a previous study of dawn and dusk boundaries to the noon and midnight regions. The boundaries are well-ordered by K in the night sector, but show increasingly greater scatter from dawn to postnoon. In the noon sector, it is often the case that no diffuse aurora is discernible within detector sensitivity. The equatorward diffuse auroral boundary is well fit by a circle at each activity level. The center of the circle is offset from the geomagnetic pole, and the radius of the circle increases with increasing magnetic activity. The circular fits are projected to the ecliptic plane by using the Mead-Fairfield magnetic field model where they are identified with the inner edge of the plasma sheet in order to make comparison with Volland-Stern type convection electric field predictions. Previously found variations of the electric field with K are confirmed, including a rotation of the axis of symmetry, away from the dawn-dusk meridian. R.J.F.

N84-14618# Department of Energy, Bartlesville, Okla.
PROCEEDINGS OF THE 1982 FORUM ON SUBSIDENCE DUE TO FLUID WITHDRAWALS
Erle C. Donaldson and Hans vanDomselaar (INTEVEP, Los Teques, Venezuela) Aug. 1983 145 p refs Proc. held at Checotah, Okla., 14-17 Nov. 1982; sponsored in part by the Ministry of Energy and Mines of the Republic of Venezuela
(DE84-001028; CONF-821199) Avail: NTIS HC A07/MF A01

Subsidence due to fluid withdrawal was discussed. Four topics are presented: (1) definition of the problem of subsidence; (2) influence of special conditions on subsidence; (3) theories and mathematical models; and (4) discussions of field cases. Transcripts of the discussions on rock mechanics and the research recommendations are included. DOE

N84-14619# Geological Survey, Baton Rouge, La.
BASE LINE FOR DETERMINING LOCAL, SMALL-SCALE VERTICAL MOVEMENTS IN LOUISIANA
Drukell B. Trahan 1983 20 p refs Presented at the Arizona Consulting Engineers Association Land Subsidence Symp., Phoenix, Ariz., 21 Oct. 1983
(Contract DE-AC08-81NV-10174)
(DE84-002569; CONF-8310193-1) Avail: NTIS HC A02/MF A01

Subsidence in Louisiana is a result of many factors ranging from local, man induced to regional, large scale processes. The measurement of local, man induced subsidence is especially critical in areas with high rates of land loss. In order to measure local vertical movement, absolute historical geodetic movements were estimated by adjusting all movements along the first order vertical control network from northeast to southwest Louisiana as related to the Monroe Uplift. The adjustment will serve as a base line by which local subsidence or uplift are measured. A generalized trend of increasing subsidence to the south in Louisiana is probably a reflection of increasing sediment thickness and weight toward the AXIS of the Gulf Coast Basin. Anomalous values as low as -17.6 mm/y occur superjacent to the position of Pleistocene and Holocene fluvial elements. Positive movement, up to +4.1 mm/y, were found associated with the Iberian structural axis in south central Louisiana. Land subsidence due to natural causes may far outweigh subsidence resulting from fluid withdrawal or depressurization of geopressured aquifers. DOE

N84-14620# California Univ., Livermore. Lawrence Livermore Lab.
RELEVANCE OF ROCK MECHANICS TO GUN PROPELLANTS
Marc Costantino 21 Oct. 1983 29 p refs Presented at the Structures and Mech. Behavior Subcomm. Meeting, Laurel, Md., 1-3 Nov. 1983
(Contract W-7405-eng-48)
(DE84-002010; UCRL-88965; CONF-831192-1) Avail: NTIS HC A03/MF A01

Over the past 30 years, earth scientists made a considerable effort to understand the mechanical response of geologic materials to large static and dynamic stresses. These materials range from loose soils to hard rock, with wide ranges of porosity, composition, particle size, and physical properties. The materials are described with fairly sophisticated equations of state that treat elastic and large strain plastic loading of porous, inhomogeneous, anisotropic bodies. Rate and temperature effects also are included, but are not as well understood. Well-developed laboratory methodology exists for studying compaction of porous bodies under hydrostatic loading, failure under shear loading, uniaxial strain loading, fluid flow through connected porosity, pressure dependence of sound speeds and moduli, and fracture of composite assemblies. Elaborate computer codes in one, two, and three dimensions are available to analyze these experiments. DOE

N84-14621# California Univ., Berkeley. Lawrence Berkeley Lab.
INVERSE TORSIONAL EIGENVALUE PROBLEMS Ph.D. Thesis
Cathering Willis Jun. 1983 136 p refs
(Contract DE-AC03-76SF-00098)
(DE84-002568; LBL-16692) Avail: NTIS HC A07/MF A01

A theoretical investigation of the inverse problem reconstruct the density, rho, and S-wave velocity, alpha, of the Earth from its torsional oscillations. We assume a spherically symmetric, nonrotating Earth which consists of a perfect elastic, isotropic material and transform the differential equation governing the torsional oscillations to a Sturm-Liouville problem. A numerical method is presented for determining rho and alpha in the upper mantle when rho and alpha are smooth functions of radius. The method, based on the Rayleigh-Ritz method, solves iteratively for the coefficients of a generalized Fourier series for the potential. The method is sensitive to error in the data. This is not true of the inversion for the density alone and suggests that the simultaneous inversion for the density and velocity from free oscillation data may be unstable. The smoothness assumption is a serious limitation of the numerical method, since most Earth models have a discontinuity at the crust and many have gradients with discontinuities in the upper mantle. The associated discontinuous Sturm-Liouville problem is studied and it is shown that if the eigenfunctions have two discontinuities and if the potential is known in half the interval then the potential in the whole interval is uniquely determined from one spectrum. This theorem is applied to the discontinuous Earth model to prove that given rho in the lower mantle and alpha in the mantle and crust, then the torsional spectra of one angular order uniquely determine rho in the upper mantle. In addition, if alpha is known only in the lower mantle, then two torsional spectra uniquely determine both rho and alpha in the upper mantle. DOE

N84-14622# Engineering and Economics Research, Inc., Vienna, Va.
GEOSCIENCE-RELATED RESEARCH NEEDS FOR GEOTHERMAL ENERGY TECHNOLOGY Final Report
C. H. Crane and J. J. Markiewicz, Jr. 30 Sep. 1983 85 p refs
(Contract DE-AC01-82ER-30041)
(DE84-001837; EER/TR-11-83) Avail: NTIS HC A05/MF A01

A project to identify and prioritize geoscience-related research needs that would be of significant benefit in the assessment, exploration, and development of US geothermal energy resources is described. The federal research needs as identified by the Panel are summarized. The research needs are organized into specific research needs for four technology areas and a group of generic research needs which relate to all of the technology areas.

Arranged in order of overall need for research, these technology areas are: reservoir engineering; resource exploration and reservoir definition; well drilling, completion, and stimulation; and environmental monitoring and control. The generic research needs are: geoscience case studies, scientific drilling, information and technology transfer, and improved research coordination. DOE

N84-14623# California Univ., Livermore. Lawrence Livermore Lab.

TECHNIQUES TO EXTEND OZONESONDE TEMPERATURE DATA TO THE MESOPAUSE

R. L. Weichel Oct. 1983 17 p refs

(DE84-002749; UCID-19913) Avail: NTIS HC A02/MF A01

An analysis of global Multichannel Filter Radiometer radiances and ozone retrieval results revealed that the simulated radiances were not always representative of the measurements for the CO2 channels sensing the temperatures in the middle and upper stratosphere. This problem was particularly pronounced, but not limited to, higher latitude winter conditions. Because of the special importance of the middle stratosphere and high latitudes for ozone analyses, a research effort was undertaken to develop an improved method (described below) of extending the temperatures from the ozonesondes used in the simulation procedure. An overview of the radiative transfer theory is provided to show the importance of the temperature profile in the calculation of simulated radiances. DOE

N84-14624# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).

PROJECT PORCUPINE: THE MF MUTUAL IMPEDANCE PROBE EXPERIMENT. PART 1: FLIGHT F2 (MARCH 1977)

L. R. O. Storey, J. Thiel, and J. M. Illiano 1 Mar. 1981 101 p refs Sponsored by CNES 2 Vol.

(CRPE-NT-93-Vol-1) Avail: NTIS HC A06/MF A01

A 0.1 to 1.5 MHz mutual impedance probe was flown on rockets in the auroral ionosphere to measure the field aligned drift velocity of the thermal electrons, from the resulting non reciprocal frequency shift of the lower oblique resonance. In the first experiment (Porcupine F2), the data exhibit frequency shifts much larger than expected, varying cyclically as the payload spun. These spurious shifts masked any shifts due to field aligned drift. They led to a redesign of the probe. Author (ESA)

N84-14625# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France).

PROJECT PORCUPINE: THE MF MUTUAL IMPEDANCE PROBE EXPERIMENT. PART 2: FLIGHTS F3 AND F4 (MARCH 1979)

L. R. O. Storey, J. Thiel, and J. M. Illiano 1 Nov. 1981 132 p refs Sponsored by CNES 2 Vol.

(CRPE-NT-94-Vol-2) Avail: NTIS HC A07/MF A01

A 0.1 to 1.5 MHz mutual impedance probe was flow on rockets in the auroral ionosphere to measure the field aligned drift velocity of the thermal electrons. In porcupine F3 data are consistent with downward electron drifts, but their apparent high velocity casts doubt on this interpretation. Data from F4 exhibit frequency shifts related to cross field of the plasma under the influence of the perpendicular component of the auroral electric field, but are larger than the values expected theoretically. The method for measuring field aligned electron drift velocity is not ready for scientific use, but would be useful if its sensitivity could be improved by an order or magnitude. Suggestions are made as to how this might be achieved. Author (ESA)

N84-14626# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).

APPLICATION OF THE MAXIMUM ENTROPY METHOD TO THE SPECTRAL ANALYSIS OF GEOPHYSICS DATA. RESULTS OF SOME PRELIMINARY TESTS ON THEORETICAL SERIES [APPLICAZIONE DEL METODO DELLA MASSIMA ENTROPIA ALL'ANALISI SPETTRALE DI DATI DI CARATTERE GEOFISICO. RISULTATI DI ALCUNE PROVE PRELIMINARI SU SERIE TEORICHE]

M. Vellante and U. Villante (Aquila Univ., Italy) Mar. 1983 79 p refs In ITALIAN

(IFSI-82-1) Avail: NTIS HC A05/MF A01

Application of the maximum entropy method to analysis of micropulsing of the geomagnetic field is considered. The relation of the method to a self regressive model of a time series is discussed and the algorithm used in the computation, is described. Results obtained using several inlet series are summarized. A sum of sinusoidal signals and white noise; a random number series; an exponential series; a Gaussian function and a Ricker series were tested. A technique to determine the location of the maximum of the spectral density and a list of the computer programs used are included. Author (ESA)

N84-14627# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).

THE PROGRAMS USED TO COMPARE THE PREDICTIONS OF SOME GEOMAGNETIC MODELS WITH THE MEASUREMENTS FROM THE EXPERIMENT S-331 ONBOARD THE GEOS-1 SATELLITE [I PROGRAMMI UTILIZZATI PER CONFRONTARE LE PREVISIONI DI ALCUNI MODELLI DEL CAMPO GEOMAGNETICO CON LE MISURE DELL'ESPERIMENTO S-331 A BORDO DI GEOS-1]

C. Signorini and E. Amata Mar. 1982 72 p refs In ITALIAN

(IFSI-82-2) Avail: NTIS HC A04/MF A01

Internal source models described by the routines FIELD and FIELDG and external source models which add the field produced by the currents on the magnetopause and the geomagnetic tail, described by the models of Olson, Olson Pfitzer, and Mead-Fairfield are implemented by a set of programs, which are detailed. The programs comparing models and experiment include the MODELLI program which computes the average of 32 field measurements, and the same field components as predicted by the different models. Other programs are used to select days of low magnetic activity, to subdivide the magnetosphere in preselected regions, to print the results, and to show the projections of the orbit of GEOS-1 on a video terminal. Author (ESA)

N84-14628 Texas Univ., Austin.

BOTTOMSIDE SINUSOIDAL WAVES, A NEW CLASS OF EQUATORIAL PLASMA IRREGULARITIES Ph.D. Thesis

Cesar Enrique Valladares 1983 116 p

Avail: Univ. Microfilms Order No. DA8317510

A new category of equatorial F region plasma irregularities having properties easily distinguished from those of plasma bubbles, depletions or broadband turbulence is described. This new class of irregularities has been identified in the data from the Retarding Potential Analyzer (RPA) and the Ion Drift Meter (IDM) on the Atmosphere Explorer satellites AE-C and -E. They are observed in the bottomside at night in a narrow belt extending approximately + or - 12 deg from the dip equator, and up to 7500 km or more in the east-west direction. High resolution data from the RPA reveal nearly sinusoidal waves in the ion number density N sub i with peak to peak delta N sub i N sub i amplitudes that span more than 3 orders of magnitude, from values less than 0.1% to more than 100%. These distinctive 'Bottom Side Sinusoidal' (BSS) irregularities typically have a central wavelength lying in the range from 300 m to 3 km, and relatively narrow spectra. Dissert. Abstr.

N84-14629 Colorado State Univ., Fort Collins.

MESOSCALE MOISTURE FIELDS RETRIEVED FROM SATELLITE INFRARED RADIANCES IN NOCTURNAL INVERSION CASES Ph.D. Thesis

Donald William Hillger 1983 155 p

Avail: Univ. Microfilms Order No. DA8317801

Mesoscale moisture fields are retrieved frm TOVS (Tiros Operational Vertical Sounder) infrared radiances from two polar-orbiting satellites. The determination of lower tropospheric moisture requires knowledge of both the surface temperature and the temperature profile. In the cases examined the temperature profiles were characterized by surface temperature inversions. By determining the surface temperature independently of the temperature profile above the surface, temperature inversions were allowed in retrieved temperature soundings. These inversions more closely matched the actual temperature profiles. However, this created a problem relating to incorrect moisture determinations until a modification for the surface temperature inversion was incorporated into the moisture feedback equation. Satellite-derived total moisture was then compared both to RAOB-measured moisture at the RAOB scale (> 250 km) and to total moisture estimated from surface dew points at the surface weather observation scale (> 250 km). Dissert. Abstr.

N84-14630 State Univ. of New York, Albany.
THE TURBULENT TRANSFER OF IONS TO THE EARTH'S SURFACE Ph.D. Thesis
Robert Freeman Henry 1983 152 p
Avail: Univ. Microfilms Order No. DA8316828

The ion balance has been investigated near the surface at several remote locations. Simultaneous observations of ion and aerosol concentrations in oceanic and polar regions show wide variation from the values predicted by this relationship. However, data collected over the North Atlantic Ocean indicate that turbulent transfer of ions to the surface of the Earth may be an important sink which should be included in the steady balance. This hypothesis has been investigated at the Amundsen-Scott South Pole Station. Ion fluxes were measured at a height of 2.5 m by means of the eddy correlation method. The mean eddy fluxes of positive and negative ions toward the surface were found to be 40 and 440 /sq cm/sec respectively. The large difference between the two is attributed to the electrode effect, which is responsible for a large gradient in the profile of the negative ion concentration. Dissert. Abstr.

N84-14631 Rice Univ., Houston, Tex.
THE TEMPORAL EVOLUTION OF SHORT SCALE STRIATIONS IN THE HEATED IONOSPHERE Ph.D. Thesis
Anthea Jane Coster 1983 156 p
Avail: Univ. Microfilms Order No. DA8314925

Three meter striations are produced in response to the heating of the ionosphere by a powerful high frequency (HF) radio wave. The striations are electron density perturbations aligned parallel to the geomagnetic field in the heated region of the ionosphere. They are formed within seconds as a direct consequence of the heating, and disappear rapidly after the heater has been turned off. Recent experiments were conducted to investigate the evolution times of the striations. The experiments combined the use of the new HF facility at the Arecibo Observatory with a portable 50 MHz radar located on either the island of St. Croix or Guadeloupe. Striations were observed in both the E and the F regions of the ionosphere. The conclusions of our investigation can be summarized as follows. First, relationships have been determined between the striations' rise and fall times and the electron collision frequency, temperature, and density. Second, the rise times of the striations are found to be dependent on the HF electric field. The nature of this dependency is presented and interpreted. Dissert. Abstr.

N84-14632 Utah Univ., Salt Lake City.
THREE-DIMENSIONAL MAGNETOTELLURIC INTERPRETATION Ph.D. Thesis
Philip Ein Wannamaker 1983 241 p
Avail: Univ. Microfilms Order No. DA8319368

An algorithm based on the method of integral equations has been developed to simulate the electromagnetic response of three dimensional (3-D) bodies in layered earths. The inhomogeneities are replaced mathematically by an equivalent current distribution which is approximated by pulse basis functions. A matrix equation is constructed using the electric dyadic Green's functions appropriate to a layered earth and is solved for the vector current in each cell. Subsequently, scattered fields are found by integrating electric and magnetic dyadic Green's functions over the scattering currents. The electric and magnetic fields scattered by a three dimensional inhomogeneity in a conducting earth result largely from current-gathering, a boundary polarization charge phenomenon that becomes increasingly important as frequency falls. Boundary charges cause normalized electric field magnitudes, and thus magnetotelluric (MT) tensor apparent resistivities and magnitudes of vertical admittance elements, to remain anomalous as frequency approaches zero. Dissert. Abstr.

N84-14633 Johns Hopkins Univ., Baltimore, Md.
SHORT PERIOD P-WAVE ATTENUATION IN THE MIDDLE AND LOWER MANTLE OF THE EARTH Ph.D. Thesis
Michael James Shore 1983 202 p
Avail: Univ. Microfilms Order No. DA8317000

Estimates of the seismic quality factor (Q) in the Earth's mantle have come primarily from the analysis of surface waves and free oscillations. The use of these data to estimate Q in the deep mantle suffers from a significant of resolution. In order to improve the resolution of Q determinations in the mantle, a large data base of digital P-wave recordings from underground nuclear explosions was compiled. P-, PcP-and PP-waves were analyzed to develop a set of t* (i.e., path travel time divided by mean-path Q) station corrections corresponding to the upper mantle beneath the station and a t* distance profile for the northern hemisphere. Regional heat flow, P-wave travel time residuals, Pn velocity and geoid height were examined but do not provide an additional constraint on these station corrections. The t* -distance profile was inverted to determine a Q profile from a depth of approximately 1200 kilometers to the coremantle boundary. Dissert. Abstr.

N84-14634 Johns Hopkins Univ., Baltimore, Md.
THE MAGNETIC PETROLOGY OF THE DEEP CRUST AND THE INTERPRETATION OF REGIONAL MAGNETIC ANOMALIES Ph.D. Thesis
Charles Martin Schlinger 1983 256 p
Avail: Univ. Microfilms Order No. DA8316999

Regional magnetic anomalies in satellite and near-surface magnetic data are observed over continental crust. The explanation of these anomalies has remained enigmatic by requiring, for crustal origin, laterally extensive, thick, highly magnetic, and deep seated sources. It is first demonstrated that certain low amplitude anomalies in older satellite data may result from inadequate orbit computations. The principal source of error in such calculations rests with the adopted gravity field model. The main contribution is a field, analytical, and experimental study of rocks from Lofoten and Vesteraalen, Norway, a high-grade province of deep seated origin with associated regional magnetic and gravity anomalies. These rocks have a bulk magnetic character of surprising uniformity, with susceptibilities, hysteresis, and Curie temperatures, defined by nearly pure magnetite. Stable remanence is observed only in samples from SW Lofoten and is rarely of significant magnitude. Contrary to speculation the thermal enhancement of magnetic susceptibility, the Hopkinson effect, is not important in type lithologies. Dissert. Abstr.

N84-14178# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
SUMMARY OF IONOSPHERIC HEATING EXPERIMENTS AT TROMSOE (NORWAY)
P. Stubbe and H. Kopka *In* ESA Active Expts. in Space Jul. 1983 p 47-50 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14179# Uppsala Ionospheric Observatory (Sweden).
OBSERVATIONS OF STIMULATED ELECTROMAGNETIC EMISSIONS DURING IONOSPHERIC HEATING EXPERIMENTS
B. Thide, Aa. Hedberg, H. Derblom, R. Bostroem, P. Stubbe (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and H. Kopka (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Active Expts. in Space Jul. 1983 p 51-52 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14183# Norwegian Defence Research Establishment, Kjeller.
PRELIMINARY RESULTS FROM THE HEATING ROCKET (HERO) PROJECT: IN SITU MEASUREMENTS OF IONO-

SPHERIC MODIFICATIONS USING SOUNDING ROCKETS
B. Grandal, G. Rose (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), J. Holtet (Oslo Univ.), K. Maaseide (Oslo Univ.), E. Neske (Inst. fuer Physikalische Messtechnik), W. Ott (Inst. fuer Physikalische Messtechnik), K. Spenner (Inst. fuer Physikalische Messtechnik), J. Troeim, H. Kopka (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), and P. Stubbe (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA Active Expts. in Space Jul. 1983 p 75-80 refs Sponsored by DFVLR and Royal Norwegian Council for Scientific and Industrial Research (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14184# Regis Coll., Weston, Mass.
IONOSPHERIC IRREGULARITIES AND GEOMAGNETIC FIELD FLUCTUATIONS DUE TO IONOSPHERIC HEATING
M. C. Lee and S. P. Kuo (Polytechnic Inst. of New York, Farmingdale) *In* ESA Active Expts. in Space Jul. 1983 p 81-89 refs (For primary document see N84-14172 05-12)
(Contract F19628-83-K-0024; Grant NSF ATM-81-114427)
Avail: NTIS HC A17/MF A01

N84-14185# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
THE ELECTRON AND ION SPECTRA OF RADAR RETURNS FROM THE CRITICAL HEIGHT DURING IONOSPHERIC HEATING EXPERIMENTS
H. Kohl, C. LaHoz (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), K. Folkestad (EISCAT, Ramfjordbotn, Norway), T. Hansen (EISCAT, Ramfjordbotn, Norway), H. Kopka, G. Rosa, and P. Stubbe *In* ESA Active Expts. in Space Jul. 1983 p 91-97 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14187*# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
FAST MAGNETOSPHERIC ECHOES OF ENERGETIC ELECTRON BEAMS
Klaus Wilhelm, William Bernstein (Rice Univ.), Paul J. Kellogg (Minnesota Univ., Minneapolis), and Brian A. Whalen (National Research Council of Canada, Ottawa) *In* ESA Active Expts. in Space Jul. 1983 p 113-120 refs Sponsored by NASA, the National Research Council (NRC) and DFVLR (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01 CSCL 04A

N84-14188# Norwegian Defence Research Establishment, Kjeller.
IONOSPHERIC MODIFICATION BY ELECTRON BEAMS. RESULTS FROM ELECTRON ACCELERATOR EXPERIMENTS ON ROCKETS IN NORWAY
Bernt N. Maehlum *In* ESA Active Expts. in Space Jul. 1983 p 121-127 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14207# Air Force Geophysics Lab., Hanscom AFB, Mass.
OVERVIEW OF PROJECT BRAZIL IONOSPHERIC MODIFICATION EXPERIMENT (BIME)
R. S. Narcisi *In* ESA Active Expts. in Space Jul. 1983 p 255-264 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14209# Los Alamos Scientific Lab., N. Mex.
MODELING OF MODIFICATION EXPERIMENTS INVOLVING NEUTRAL GAS RELEASE
Paul Bernhardt *In* ESA Active Expts. in Space Jul. 1983 p 271-277 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14210# National Research Council of Canada, Ottawa (Ontario). Herzberg Inst. of Astrophysics.
PROJECT WATERHOLE III
B. A. Whalen, A. W. Yau, A. G. Creutzberg, A. G. McNamara, F. R. Harris, R. L. Gattinger, D. D. Wallis, M. Pongratz (LASL, N. Mex.), P. Bernhardt (LASL, N. Mex.), P. Kintner (Cornell Univ., Ithaca, N.Y.) et al *In* ESA Active Expts. in Space Jul. 1983 p 279-283 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14211# Boston Univ., Mass. Dept. of Astronomy.
ROCKET EXHAUST EFFECTS AS ACTIVE SPACE PLASMA EXPERIMENTS OF OPPORTUNITY
M. Mendillo *In* ESA Active Expts. in Space Jul. 1983 p 285-292 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14212# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
COLORED BUBBLES: AN EXPERIMENT FOR TRIGGERING EQUATORIAL SPREAD F
G. Haerendel, O. H. Bauer, S. Cakir, H. Foeppl, E. Rieger, and A. Valenzuela *In* ESA Active Expts. in Space Jul. 1983 p 295-298 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14213# Air Force Geophysics Lab., Hanscom AFB, Mass.
PLASMA COMPOSITION AND STRUCTURE CHARACTERIZATION OF AN IONOSPHERIC BARIUM CLOUD
R. S. Narcisi and E. P. Szuszczewicz (Hulburt (E. O.) Center for Space Research, Washington, D.C.) *In* ESA Active Expts. in Space Jul. 1983 p 299-304 refs Sponsored by Defense Nuclear Agency, Office of Naval Research and AFOSR (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14214*# Los Alamos Scientific Lab., N. Mex. Group Ess-8.
CREATING UNSTABLE VELOCITY-SPACE DISTRIBUTIONS WITH BARIUM INJECTIONS
Morris Pongratz *In* ESA Active Expts. in Space Jul. 1983 p 305-310 refs Sponsored by NASA Earth Science and Applications Div. and US Dept. of Energy (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01 CSCL 04A

N84-14215# National Research Council of Canada, Ottawa (Ontario). Hertzberg Inst. of Astrophysics.
SEQUENTIAL BARIUM RELEASES TO STUDY TANGENTIAL VERSUS ROTATIONAL DISCONTINUITIES IN AURORAL ARCS
A. W. Yau, B. A. Whalen, F. Creutzberg, and R. L. Gattinger *In* ESA Active Expts. in Space Jul. 1983 p 313-315 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14216# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE ACTIVE MAGNETOSPHERIC PARTICLE TRACER EXPLORERS (AMPTE) PROGRAM
S. M. Krimigis, G. Haerendel (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), R. W. McEntire, G. Paschmann (Max-Planck Inst. fuer Extraterrestrische Physik, Garching, West Germany), and D. A. Bryant (Science Research Council, Chilton, England) *In* ESA Active Expts. in Space Jul. 1983 p 317-325 refs Sponsored by Maryland Univ., Lockheed Palo Alto Research Laboratories, California, TRW, Bundesministerium fuer Forschung und Technologie, Max-Planck Society, and UK Science and Engineering Research Council) (For primary document see N84-14172 05-12)
(Contract N00024-78-C-5384)
Avail: NTIS HC A17/MF A01

N84-14217# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
ION COUPLING TO MAGNETOSHEATH BULK MOTION
Armando L. Brinca (Instituto Superior Tecnico, Lisbon) *In* ESA Active Expts. in Space Jul. 1983 p 327-335 refs Sponsored by Alexander von Humboldt Foundation (For primary document see

N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14219# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
ACTIVE EXPERIMENTS AND SINGLE ION MOTION IN THE MAGNETOTAIL
P. L. Rothwell and G. K. Yates *In* ESA Active Expts. in Space Jul. 1983 p 341-345 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14222*# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
ELECTRODYNAMIC TETHER EXPERIMENTS IN THE IONOSPHERE
W. J. Raitt, P. M. Banks (Stanford Univ.), and P. R. Williamson (Stanford Univ.) *In* ESA Active Expts. in Space Jul. 1983 p 361-367 refs (For primary document see N84-14172 05-12) (Grant NAGw-235)
Avail: NTIS HC A17/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-14635 Royal Netherlands Meteorological Inst., De Bilt.
BIBLIOGRAPHY OF THE CLIMATE OF THE NETHERLANDS AND ATMOSPHERIC CONDITIONS IN THE NETHERLANDS
J. vanderLingen, comp. 1983 141 p refs In DUTCH; ENGLISH summary
(KNMI-164) Avail: Issuing Activity

An annotated climatological bibliography of the Netherlands containing around 2000 items covering the period between 1200 and 1980 is presented. Author (ESA)

N84-14636*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-8) LAUNCH
D. L. Johnson, C. K. Hill, R. E. Turner, and G. W. Batts (Computer Sciences Corp.) Oct. 1983 55 p refs
(NASA-TM-82560; NAS 1.15:82560) Avail: NTIS HC A04/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-8 launch time on August 30, 1983, at Kennedy Space Center, Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given. Also presented are wind and thermodynamic parameters representative of surface and aloft conditions in the SRB descent/impact ocean area. Final meteorological tapes, which consist of wind and thermodynamic parameters versus altitude, for STS-8 vehicle ascent and SRB descent/impact were constructed. The STS-8 ascent meteorological data tape was constructed. Author

N84-14637# Naval Postgraduate School, Monterey, Calif.
ON THE UNSTEADY RESPONSE OF AN OCEANIC FRONT TO LOCAL ATMOSPHERIC FORCING M.S. Thesis
Christopher James Hall Jun. 1983 121 p
(AD-A132215) Avail: NTIS HC A06/MF A01 CSCL 08/3

The unsteady response of two oceanic density fronts to local atmospheric forcing, using combinations of wind stress and surface heat flux, is investigated with an embedded mixed layer-general circulation model. The adjustment of the frontal structure is dependent upon the wind stress direction and whether there is surface heating or cooling. In cases of an applied wind stress alone where denser water is transported toward less dense water, the frontal structure diffuses, the mixed layer depth deepens, and cross-frontal mixing occurs. In cases where less dense water is transported toward denser water, the frontal structure is preserved, mixed layer depth is preserved and cross-frontal mixing is minimized. The addition of surface heating shallows the mixed layer and inhibits vertical mixing. Inertial oscillations are observed in the across-front velocity field. GRA

N84-14638# Naval Oceanography Command Center/Joint Typhoon Warning Center, FPO San Francisco, Calif.
TROPICAL CYCLONES AFFECTING GUAM (1671-1980)
Robert C. Weir Sep. 1983 56 p
(AD-A134016; AD-F300328; NOCC/JTWC-TN-83-1) Avail: NTIS HC A04/MF A01 CSCL 04/2

A climatology of tropical cyclones passing within 180 nm of Guam is presented for the period 1948 to 1980. A review of all typhoons affecting Guam is carried back to 1800 and some noteworthy typhoons of the 1600's are included. The survey emcompasses the frequency, behavior, meteorological effects and descriptive chronicles of Guam tropical cyclones. The major emphasis is on the period since World War II. Author (GRA)

N84-14639# Air Force Geophysics Lab., Hanscom AFB, Mass.
TIME LAPSE SIMULATION OF INTERRELATED WEATHER CONDITIONS
Irving I. Gringorten 20 May 1983 45 p
(AF Proj. 6670)
(AD-A133999; AFGL-TR-83-0141; AFGL-ERP-839) Avail: NTIS HC A03/MF A01 CSCL 04/2

This paper has been prompted by the need, in war games, for a stochastic model of the sequence of weather conditions as they might impinge on air/ground combat operations. Such a time sequence of weather, including ceiling, visibility, and cloud cover, for one or more stations, has been perceived as inadequately modeled, so far. The present work is based on previously developed sequences in the Ornstein-Uhlenbeck process. Joint sequences call for a modification, but still basically comprise a Markov process. Formulas or algorithms have been developed for the joint occurrence of two interrelated events changing simultaneously in a Markov time sequence. The model process is particularly applicable to a changing combination of ceiling and visibility at one station, or to the changing combination of cloud cover at two adjacent stations. A brief examination of the time sequence of three simultaneous events reveals a rapidly increasing complication of solution, making an alternative study of a real coverage of weather conditions more acceptable when more than two variables are involved. GRA

N84-14640# Weather Squadron (28th). New York 09238. Detachment 36.
TERMINAL FORECAST REFERENCE NOTEBOOK FOR RAF ALCONBURY, ENGLAND Final Report
3 Oct. 1983 68 p
(AD-A133835) Avail: NTIS HC A04/MF A01 CSCL 04/2

Contents: Location and Topography; Climatic Aids; Approved Local Forecast Studies and Rules of Thumb; Weather Controls and Synoptic Case Studies. GRA

N84-14641# Xonics, Inc., Van Nuys, Calif.
AFCRL (AIR FORCE CAMBRIDGE RESEARCH LABORATORIES) ACOUSTIC WIND SENSOR SYSTEM Final Summary Report, 10 Apr. 1973 - 3 Jul. 1974
Charles A. McNary and Arthur E. Nagy Hanscom AFB, Mass. AFCRL 3 Jul. 1974 8 p
(Contract F19628-73-C-0201; AF Proj. 7655)
(AD-A133739; AFCRL-TR-74-0322) Avail: NTIS HC A02/MF A01 CSCL 04/2

A remote wind measuring system is a useful analytical tool for meteorological studies. Advantages over tower-mounted sensors include a higher degree of portability, less maintenance, and the absence of a structure which would modify the velocities by its presence. A description of the successful design, fabrication, and testing of such a system is given. Author (GRA)

N84-14642# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.

TRANSPORT AND DIFFUSION OF BUOYANT MATERIAL Final Report
James L. Cogan May 1983 46 p
(DA Proj. 1L1-61102-B-53A)
(AD-A132613; ERADCOM/ASL-TR-0130) Avail: NTIS HC A03/MF A01 CSCL 04/2

Transport and diffusion of dust and nonbuoyant smokes are simulated realistically by the particle model originally developed at the US Army Atmospheric Sciences Laboratory by Ohmstede and Stenmark. A new and simple algorithm accounts for buoyant smokes and/or dust. This technique uses the difference in temperature between individual particles and the ambient atmosphere to compute an additional vertical acceleration. The technique takes into consideration entrainment at the sides and top of the cloud, as well as the ingestion of unheated material at, or loss of heat by contact with, the ground during initial release and during subsequent surface contact. Some sample computer runs suggest that the particle model with this new algorithm can model realistically the transport and diffusion of buoyant material. Author (GRA)

N84-14643# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorological Div.
METEOROLOGICAL SENSORS FOR BATTLEFIELD WEATHER SUPPORT Final Report
Frederick J. Brousaides 15 Apr. 1983 65 p
(AF Proj. 2688)
(AD-A132623; AFGL-TR-83-0112; AFGL-ERP-836) Avail: NTIS HC A04/MF A01 CSCL 04/2

The work described in this report is in support of MAC SON 508-78, Pre-Strike Surveillance and Reconnaissance System (PRESSURS), which has identified deficiencies in the Air Force's ability to acquire meteorological observations in uncontrolled and hostile airspace. Primary requirements include temperature, pressure, humidity, winds, cloud field parameters, and visibility. Suitable sensors are identified and evaluated for deployment with various scenarios, that is, remotely-piloted vehicle, dropsonde, and ground implantation. Where deficiencies in the state-of-the-art exist, programs were initiated for the development of new instrumentation, and where necessary, models were constructed for translation of sensor output into useful operational weather information. Author (GRA)

N84-14644# Arizona Univ., Tucson. Dept. of Electrical and Computer Engineering.
MEASUREMENTS OF OPTICAL PROPERTIES OF PARTICULATES IN AN ARID REGION Final Report, 15 Mar. 1982 - 30 Apr. 1983
John A. Reagan 31 Aug. 1983 25 p
(Contract DAAG29-82-K-0081)
(AD-A132889; ARO-15520.1-GS; ARO-18995.1-GS) Avail: NTIS HC A02/MF A01 CSCL 04/2

Aerosol extinction profiles and aerosol extinction-to-backscatter ratio, S(a), values have been determined for numerous days over the period May, 1979 to May, 1982 in Tucson, AZ via slant-path lidar measurements. These results have been analyzed to obtain a model aerosol extinction profile and a model S(a) value. The model extinction profile is characterized by rapidly, nearly linearly decreasing extinction through a 3km mixing layer (decreasing from 0.018/km at 200 m to 0.003/km at 3km), and a much more slowly decreasing extinction above the mixing layer. The mixing layer optical depth is about 0.04, and the optical depth to the maximum observation height (19km) is about 0.07. The inverse variance weighted S(a) value is about 25, and the majority of the S(a) determinations fell between 20 and 35. A limited number of cooperative lidar and balloon-borne cascade impactor measurements were also made to investigate aerosol size distribution and refractive index properties and their effects on the lidar observations. Impactor measurements yielded size distributions that were generally similar in shape, the distributions being perturbed Junge types with a dominance of coarse mode particles causing a bulge in the distributions in the large particle range. GRA

N84-14645# Army Missile Command, Redstone Arsenal, Ala.
WIND SPEED, STABILITY CATEGORY, AND ATMOSPHERIC TURBULENCE AT SELECTED LOCATIONS
Oskar M. Essenwanger and Dorathy A. Stewart May 1983 78 p
(AD-A132947; AD-E950425; DRSMI/RR-83-2-TR) Avail: NTIS HC A05/MF A01 CSCL 04/2

This report includes climatological information about wind speed, atmospheric stability, and turbulent wind fluctuations. It contains frequency distributions of observed surface wind speeds at 35 stations located throughout the Northern Hemisphere. Observations from two German stations and one Korean station are classified as a function of wind speed and stability category. A procedure is developed to use these observations to prepare seasonal climatologies of turbulent wind fluctuations. Our data on Pasquill category and wind speed relationship are also compared with four locations in the United States described in the literature. Finally, the United States data were also used to compute an annual climatology of turbulent wind fluctuations. Author (GRA)

N84-14646# California Univ., Livermore. Lawrence Livermore Lab.
MATHEMATICAL AND PHYSICAL SCALING OF TRIGGERED LIGHTNING
R. W. Ziolkowski and J. B. Grant Dec. 1982 22 p refs
(Contract W-7405-eng-48)
(DE84-002480; UCID-19655) Avail: NTIS HC A02/MF A01

As the aircraft industry incorporates current technology in airborne systems, electromagnetic compatibility can decrease. Composite fuselages can be more transparent to EMP, whether nuclear or lightning generated, than metal ones. Solid-state circuitry is sensitive to intense EM fluctuations whereas mechanical controls generally are not. With this increased vulnerability comes increased concern for these dangers. Recently the anxiety over lightning has risen. Answers are sought to such questions as: how do the lightning EM effects couple into the aircraft's interior. Do aircraft trigger lightning, and if so, can the triggering be minimized. An understanding, at least to some extent, of lightning would provide a needed foundation to examine the interaction of aircraft with lightning. A review of the literature on lightning and lightning-aircraft investigations, including triggered lightning, was conducted and is briefly summarized. In addition, scaling the lightning event to laboratory size is also discussed. The ability to scale would allow accurate investigation of lightning effects, as well as the triggering phenomena, in scaled experiments. DOE

N84-14647# Royal Netherlands Meteorological Inst., De Bilt. Centrale Weerdienst.
ORGANIZED MICROSCALE STRUCTURE OF THE WINDSTORM OF 12 MAY 1983 IN UTRECHT AND VICINITY
Gregory S. Forbes 1983 18 p refs
(KNMI-TR-36) Avail: NTIS HC A02/MF A01

A sudden, tornado-like storm is described. The damage path of the storm is discussed. It is suggested that the damage was produced by a vortex translating at 70 km/hr and with a component of rotation about the vortex axis of 30 km/hr, and occasionally up to 60 km/hr. This rotation was probably maximum at a radius of 100 to 150 m, with damaging winds extending outward to 200 to 300 m on the right side, and much weaker winds on the left side. There is evidence of the existence of two vortices in one section, explaining the anomalously-wide damage path there. Author (ESA)

N84-14648# Scripps Institution of Oceanography, San Diego, Calif.
ESTIMATING OCEANIC RAINFALL USING MICROWAVE AND GOES INFRARED SATELLITE DATA Final Report
Alan D. Fox Mar. 1983 60 p refs
(Grant NA79SA-C-00740)
(PB83-253013; NOAA-83082407) Avail: NTIS HC A04/MF A01 CSCL 04B

Since the mid 1960s, various techniques have been developed to estimate rainfall over land using satellite imagery. Among them, the most widely used is the convective rainfall technique of Scoffield and Oliver (1977). The Scoffield/Oliver algorithm, and all other algorithms based on visible and infrared satellite imagery, do not

measure rainfall directly. One way to avoiding these problems associated with the visible and infrared techniques is to estimate rainfall using observations of radiation in the super high frequency (microwave) region. Wilheit et al. (1977) has addressed the problem of estimating oceanic rainfall using microwave radiation, and an oceanic rainfall atlas was generated using this algorithm. The purpose of this work is to test Wilheit's assumptions and develop an algorithm for calculation rainfall intensity using Wilheit's generalized brightness temperature/rainfall intensity relationship.
GRA

N84-14649# National Climate Program Office, Washington, D.C.
NATIONAL CLIMATE PROGRAM Annual Report
30 Nov. 1982 43 p refs
(PB83-253278) Avail: NTIS HC A03/MF A01 CSCL 04B

This third annual report of the National Climate Program contains a summary of significant achievements during fiscal year 1981. The major aspects of progress during 1981 were as follows: in the short term, there were significant steps in measurements of the upper atmosphere and in processing and disseminating data for assessments, research, and applications; in the intermediate term, progress was made in diagnostic studies of climate and in developing objective forecast verification techniques; and, for the long term, there was progress in planning for ocean climate field programs and for studying the role of clouds in climate.
Author (GRA)

N84-14650# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
AIRCRAFT HAZARD ASSESSMENT FROM A CLEAR-AIR RADAR AND METEOROLOGICAL TOWER STUDY OF GRAVITY WAVE EVENTS
Earl E. Gossard, ed. Jun. 1983 23 p
(PB83-257139; NOAA-83090106) Avail: NTIS HC A02/MF A01 CSCL 04B

An exceptionally well-defined gravity wave event, recorded by radar and on the 300 meter meteorological tower near Erie, Colorado, is analyzed. Special attention is given the kinematic structure within the wave to assess possible hazards to aircraft. It is found that changes of about 5 ms in vertical velocity would be encountered by an aircraft in a time period of 6.5 s. A similar change in air speed would be encountered 90 degrees out of phase with the up-downdraft. The maximum effect in this event was at a height of 100-150 m above the ground. Events of this kind often occur in fair weather under thermally stable atmospheric conditions, and would not, therefore, be predicted from the usual reasoning about near-ground hazards to aircraft. GRA

N84-14651# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
DOCUMENTATION OF NCAR (NATIONAL CENTER FOR ATMOSPHERIC RESEARCH) CCMOB PROGRAM MODULES
David L. Williamson, Linda M. Bath, Richard K. Sato, Thomas A. Mayer, and Michael L. Kuhn Jul. 1983 203 p refs Sponsored in part by National Science Foundation
(PB83-263996; NCAR/TN-212) Avail: NTIS HC A10/MF A01 CSCL 04B

This report describes the program modules (main program, subroutines, functions, and common blocks) included in the NCAR Community Climate Model COMOB library, except those involved with the radiation parameterization. The subroutines are described in alphabetical order with a standard format, followed by the common blocks, also in alphabetical order. In addition, lists of various categories of utility routines are presented along with a model flow diagram. Author (GRA)

N84-14652# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
USERS' GUIDE FOR THE NCAR (NATIONAL CENTER FOR ATMOSPHERIC RESEARCH) CCM (COMMUNITY CLIMATE MODEL) MODULAR PROCESSOR
Richard J. Wolski and Michael A. Dias Aug. 1983 151 p Sponsored in part by the National Science Foundation
(PB83-264002; NCAR/TN-216) Avail: NTIS HC A08/MF A01 CSCL 04B

The NCAR CCM Modular Processor is the primary tool for the analysis of data output by the NCAR Community Climate Model. Several kinds of computations may be requested, including vertical interpolation to pressure surfaces, zonal and time averaging, additional time average statistics, and case comparison (differences and ratios). Graphics output may be presented in several different instructions for running the Processor on the CRAY-1 at NCAR. Part 2 documents the code in sufficient detail to allow the user to make a wide variety of modifications. Author (GRA)

N84-14653# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
GENESIS AND DEVELOPMENT OF DEEP CONVECTIVE STORMS Final Report
P. C. Sinclair and J. F. W. Purdon Jan. 1983 64 p refs
(Grant NA80AA-D-00056)
(PB83-252452; NOAA-83082408) Avail: NTIS HC A04/MF A01 CSCL 04B

During the summer of 1980, NESS sponsored a research aircraft field program that combined research aircraft flights with rapid scan GOES imagery to provide a better understanding of the natural mechanisms that lead to the development of deep convective storms. The experiment provided a unique data base from which the convective storm's mesoscale flow field (dynamic and thermodynamic properties) could be documented by in situ measurements and near simultaneous GOES visible and infrared data. GRA

N84-14654 Colorado State Univ., Fort Collins.
TROPICAL CYCLONES IN THE AUSTRALIAN/SOUTHWEST PACIFIC REGION Ph.D. Thesis
Greg Joseph Holland 1983 273 p
Avail: Univ. Microfilms Order No. DA8317802

Some results are presented from the completed first stage of a collaborative Colorado State University/Australian Bureau of Meteorology project to investigate various aspects of tropical cyclones in the Australian/southwest Pacific region. A brief description is given of the major environmental and geographical features of this region, together with an overview of previous research work. The distinguishing climatological and structural features of tropical storms, hurricanes and major hurricanes are discussed throughout the region, and the effects of the prevailing flow patterns are highlighted. Finally, a theoretical and observational examination of the mechanisms leading to development, intensification and motion of these cyclones is presented. Dissert. Abstr.

N84-14655 Catholic Univ. of America, Washington, D.C.
THE INSTABILITY OF OSCILLATORY EKMAN BOUNDARY-LAYER FLOW Ph.D. Thesis
Pabitra Narayan Majumdar 1983 173 p
Avail: Univ. Microfilms Order No. DA8313960

Stability of the oscillatory Ekman boundary-layer flow is investigated analytically. The classical atmospheric Ekman layer ensures on the Earth's surface due to a steady, horizontal geostrophic wind in the Earth's atmosphere. The classical Ekman flow is modified by the superposition of a time-periodic velocity on the steady geostrophic flow. The basic flow in the oscillatory Ekman layer is formulated in the rotating coordinate system and the disturbance equations are derived based on the linear theory of temporal instability. These time-dependent disturbance equations comprise two partial differential equations, coupled by the vertical gradient of one horizontal component of the disturbance velocity. The numerical formulation of these equations is done by way of a spectral representation of the spatial dependence of the disturbance stream functions using Chebyshev polynomials. The temporal solution for the disturbance growth characteristics is obtained using the Floquet theorem in conjunction with a perturbation technique. Dissert. Abstr.

N84-14656 California Univ., Los Angeles.
BAROCLINIC AND BAROTROPIC INSTABILITY WITH CUMU-

LUS HEATING AND TROPICAL CYCLOGENESIS Ph.D. Thesis
Shrinivas Moorthi 1983 327 p
Avail: Univ. Microfilms Order No. DA8314668

To better understand the problem of tropical cyclogenesis, baroclinic and barotropic instability with parameterized cumulus heating is studied with an emphasis on basic zonal flows with easterly shear. The sensitivity of the conditional instability of the second kind (CISK) to variations in the basic thermodynamic structure is studied, using a three-level model with the Arakawa-Schubert cumulus parameterization. The model is then used to study the stability properties or various basic states with non-zero vertical shear. It is found that cumulus heating has an enormous influence on the instability. For low relative humidities, the Charney modes for westerly as well as easterly shears are destabilized. For high relative humidities, however, the Charney mode for easterly shear is stabilized, while, the enhanced heating due to the increase relative humidity leads to the destabilization of longer waves for easterly shear. The wavelength of these unstable waves in easterly shear decreases and their growth rate increases with the relative humidity. Dissert. Abstr.

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-14657# Delaware Univ., Newark. Dept. of Civil Engineering.
PROPAGATION OF WEAKLY-NONLINEAR SURFACE WATER WAVES IN REGIONS WITH VARYING DEPTH AND CURRENT Research Report, 14 Jun. 1982 - 13 Jun. 1983
James Thornton Kirby, Jr. Jul. 1983 344 p
(Contract N00014-82-K-0665)
(AD-A132593; CE-83-37; TR-14) Avail: NTIS HC A15/MF A01 CSCL 08/3

This report represents a study of the equations governing the propagation of weakly nonlinear waves in regions where currents exist and where the depth and current are allowed to vary. After deriving a velocity potential applicable to propagating surface waves according to the Stokes expansion, the Lagrangian governing wave motion in the propagation space is derived. A consistent perturbation scheme then leads to the equations governing the wave and current motion at each order in the Stokes series. After neglecting time dependence of the wave amplitude, parabolic equations governing the combined refraction and diffraction of Stokes waves of small amplitude are developed and used to calculate the wavefields for several representative cases illustrating the importance of nonlinear effects. The computational models are verified by comparison to laboratory data of wave amplitude for a wavefield focussed by a submerged shoal, and it is found that the nonlinear model accounts for the major discrepancies found between linear model results and the laboratory data. Author (GRA)

N84-14658# Naval Postgraduate School, Monterey, Calif.
A STATISTICAL APPROACH FOR DETERMINING SUBSURFACE THERMAL STRUCTURE FROM SEA SURFACE TEMPERATURE IN THE NORTHEAST PACIFIC OCEAN M.S. Thesis
Terry A. Howell Jun. 1983 194 p
(AD-A132204; AD-E750839; NPS68-83-003) Avail: NTIS HC A09/MF A01 CSCL 08/10

Bathythermograph data acquired from the research vessel USNS SILAS BENT along a meridional track in the Northeast Pacific during September 1977 were statistically analyzed to determine possible associations between the subsurface thermal structures and sea surface temperature. Strongly correlated variables (thermocline gradients, mixed layer depth, and locations of the seasonal and main thermoclines) within the vertical temperature profile were used in linear regression methods to form empirical relationships. The generated equations then are utilized to define the subsurface thermal structure from only an input of sea surface temperature. Comparison tests with temporally and spatially removed BT data were conducted with results indicating successful application within a water mass domain with uniformly changing characteristics. GRA

N84-14659# Woods Hole Oceanographic Institution, Mass.
LONG TERM UPPER OCEAN STUDY (LOTUS) AT 34 DEG N, 70 DEG W: METEOROLOGICAL SENSORS, DATA AND HEAT FLUXES FOR MAY-OCTOBER 1982 (LOTUS-3 AND LOTUS-4)
Clara Deser, Robert A. Weller, and Melbourne G. Briscoe Sep. 1983 71 p
(Contract N00014-76-C-0197)
(AD-A133883; WHOI-83-32) Avail: NTIS HC A04/MF A01 CSCL 04/2

Meteorological data have been gathered from a moored surface buoy at 34 deg N, 70 deg W in the Long Term Upper Ocean Study (LOTUS) experiment. The meteorological results from the first year of LOTUS are encouraging; the data returned form redundant sensors agree closely. Surface heat fluxes calculated from the observations show the annual cycle of heat transfer to the mixed layer. This report documents the meteorological sensors on the LOTUS-3 (May 1982-October 1982) and LOTUS-4 (November 1982-March 1983) surface buoys. It describes in detail the telemetry of the meteorological data via the ARGOS satellite system. The measurements returned from LOTUS-3 are presented and evaluated. Monthly heat fluxes at the sea surface are computed using the bulk formulas and compared with the long-term means. The errors in the heat fluxes have been estimated. GRA

N84-14660# National Oceanic and Atmospheric Administration, Rockville, Md. National Ocean Service.
TIDE TABLES 1984, HIGH AND LOW WATER PREDICTIONS, CENTRAL AND WESTERN PACIFIC OCEAN AND INDIAN OCEAN
1983 391 p
(PB83-255166; NOAA-83083101) Avail: NTIS HC A17/MF A01 CSCL 08C

The report contains tables of the predicted times and heights of the high and low waters for each day of the year at a number of places, which are designated as reference stations. By the application of tidal differences and ratios given to the predictions for the reference stations, the mariner is enabled to obtain the approximate times and heights of the tide at many other places. High and low waters can be selected from the predictions by comparison of consecutive heights. High water is the maximum height reached by each rising tide, and low water the minimum height reached by each falling tide. Because of diurnal inequality, however, at certain places there may be a difference of only a few tenths of a foot between one high water and low water of a day but a marked difference in height between the other high water and low water. It is essential, therefore, in using tide tables to carefully note the heights as well as the times of the tide. Author (GRA)

N84-14164# Joint Publications Research Service, Arlington, Va.
OCEAN COLOR STUDIES FROM SALYUT-7
Vadim Kozhevnikov *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 21 Transl. into ENGLISH from Pravda (Moscow), 26 Aug. 1983 p 3 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-14661# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
SUGGESTIONS CONCERNING TECHNOLOGICAL RESEARCH AND DEVELOPMENT FOR THE PURPOSE OF INDUSTRIAL USE OF MARINE ALGAE Final Report
Baerbel Hahn-Haegerdal 1983 26 p refs Transl. into ENGLISH of Rept. no. 80-3445 National Swedish Board for Tech. Develop-

ment, Lund (Sweden), 28 Oct. 1981 p 1-25
(ISSN-0077-5606; NRC/CNR-IT-2071) Avail: NTIS
HC A03/MF A01

Selection of new algae species in respect to parasite and disease resistance, adjustment to cultivation and harvest systems, and the profitability in respect to the technologically important components; development of cultivation systems suitable for the Swedish conditions; joint cultivation of fish, mussels, oysters and crustaceans with algae; cultivation of algae in certain municipal waste waters; development of harvesting systems; methane-fermentation; fatty acid - hydrocarbon production as an alternative to the methane fermentation; physical-chemical properties of the marine polysaccharides in relation to their technical properties; and marine algae as a food or fodder supplement are discussed.
N.W.

N84-14662# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ULTRASTRUCTURAL ORGANIZATION OF THE BLUE-GREEN ALGA MICROCYSTIS AERUGINOSA KUETZ. EMEND. ELENK IN CONNECTION WITH TOXICOGENESIS
A. A. Avakyan and O. I. Baulina 24 Aug. 1983 11 p Transl. into ENGLISH from Zh. Mikrobiol., Epidemiol. Immunobiol. (USSR), v. 49, no. 8, Aug. 1972 p 106-109 + 1
(AD-A132540; FTD-ID(RS)T-0764-83) Avail: NTIS
HC A02/MF A01 CSCL 06/3

The majority of strains of the blue-green algae Microcystis aeruginosa produce a very strong toxin. Water reservoirs, where blue-green algae abound, become toxic. The ultrastructure of this algae contains the knowledge for toxin formation. This necessitates further study.
Author

N84-14663# Rhode Island Univ., Kingston.
THE ROLE OF OXYGEN RADICALS IN BIOLOGY AND MEDICINE
1983 24 p Conf. held in Ventura, Calif., 7-11 Feb. 1983
(Contract N00014-82-G-0107)
(AD-A133053) Avail: NTIS HC A02/MF A01 CSCL 06/1

The chemistry of oxygen radicals, biological oxidations, biochemistry of oxygen radicals, antioxidants, biological impacts (prostaglandin/inflammation, cancer/pathology, and aging blood) are discussed.
N.W.

N84-14664# Randomline, Inc., Huntingdon Valley, Pa.
BEHAVIORAL AND PRENATAL EFFECTS OF 60-Hz FIELDS
Aug. 1983 26 p
(Contract DE-AC02-80RA-50293)
(DE84-001126; DOE/RA-50293/1) Avail: NTIS
HC A03/MF A01

The purpose was to determine possible neural, behavioral, and reproductive effects of low intensity 60-Hz electric fields on mammals (rats) exposed in utero. The tests used shortly after birth included negative geotaxis, the acoustic startle response, surface righting, in air righting, cliff avoidance, emotionality, and swimming endurance. Variations between the exposed and control groups are discussed.
DOE

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-14665# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECTS OF ACUTE COLD EXPOSURE ON SUBMAXIMAL ENDURANCE PERFORMANCE
John F. Patton and James A. Vogel 1983 20 p
(AD-A132581; USARIEM-M-44/83) Avail: NTIS
HC A02/MF A01 CSCL 06/19

The purposes of this study were to assess VO2 max and submaximal endurance time to exhaustion (ET) during acute cold-air exposure. Eight male subjects (X age = 19.9 yrs) were alternately exposed in groups of four to chamber temperatures of +20 C and -20 C for 30 hrs each. A week was allowed between exposures. VO2 max was measured using a mechanically braked cycle ergometer. ET was determined on the same ergometer using a 17 min - 3 min exercise - rest schedule until the subject was unable to maintain pedal rate. The data support the contention that aerobic capacity is not altered by cold exposure but suggest a marked decrease in submaximal endurance performance. It is postulated that this may result from a glycogen wasting effect due to increased catecholamine release in response to the cold.
GRA

N84-14666# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELECTROMYOGRAPHIC ANALYSIS OF THE PERONEOUS LONGUS DURING BICYCLE ERGOMETRY ACROSS WORK LOAD AND PEDAL TYPE M.S. Thesis - North Carolina Univ.
Danny Lee Holt 1983 61 p
(AD-A132550; AFIT/CI/NR-83-24T) Avail: NTIS
HC A04/MF A01 CSCL 06/5

Lateral ankle injuries often result in residual disability. Increasing the endurance of the peroneous longus may reduce this problem. Bicycle ergometry may increase the endurance of the peroneous longus, but the activity of the peroneous longus during pedaling is not known. The purpose of this study was to analyze the electromyographic (EMG) activity of the peroneous longus across work load (1, 2, and 3 Kp) and pedal type (standard and medial support only) during pedaling. The analysis included total, peak, and phasic EMG activity per cycle. EMG activity was monitored with bipolar surface electrodes arranged in a longitudinal configuration over the motor points. The pedaling cycle was monitored with a photo electric cell and the gait cycle was monitored with a heel switch. Gait data were used to normalize the pedaling data. Data from nineteen muscles were collected from eleven subjects, all adult males. Results indicated that: (1) increasing work load significantly increases the total, peak, and phasic EMG activity; (2) modified pedals significantly increase the total, peak, and phasic EMG activity; (3) the interaction between work load and pedal type significantly increases the total and peak EMG activity; and (4) only pedaling with modified pedals results in EMG activity comparable to gait.
GRA

N84-14667# California Univ., Los Angeles. Dept. of Psychology.
NEUROMAGNETIC LOCALIZATION OF TWO COMPONENTS OF THE TRANSIENT VISUAL EVOKED RESPONSE TO PATTERNED STIMULATION
F. Richer, D. S. Barth, and Jackson Beatty Apr. 1983 11 p Presented at the 4th Intern. Workshop on Biomagnetism, Rome, 14-16 Sep. 1982
(Contract N00014-76-C-0616; NR Proj. 201-207)
(AD-A132546; TR-32) Avail: NTIS HC A02/MF A01 CSCL 06/16

Corresponding electrical and magnetic components of the brain's visual evoked response at 120 and 180 ms poststimulus are examined. Results show that both magnetic components are localized in the superficial occipital cortex tangential to the scalp. The distribution of M120 suggests that the generators of the electrical and magnetic components are related, but the electrical field recorded is an elaborate modification of that produced by the source.
Author

N84-14668# California Univ., Los Angeles. Lab. for Human Neurophysiology.
MAGNETOENCEPHALOGRAPHY
Jackson Beatty, Francois Richer, and Daniel S. Barth 1 Sep. 1983 35 p Submitted for publication
(Contract N00014-76-C-0616)
(AD-A132496; TR-30) Avail: NTIS HC A03/MF A01 CSCL 06/16

Under certain conditions the activity of large neurons within the brain may produce magnetic fields that are recordable at the scalp. Such recording has been termed magnetoencephalography, the magnetic counterpart of electroencephalography. In this paper, we describe some properties of brain magnetic activity and review the recent application of magnetoencephalography to the study of both normal human brain function and cases of cerebral pathology. GRA

N84-14669# Army Research Inst. of Environmental Medicine, Natick, Mass.

AEROBIC FITNESS AND THE HYPOHYDRATION RESPONSE TO EXERCISE-HEAT STRESS

Bruce A. Cadarette, Michael N. Sawka, Michael M. Toner, and Kent B. Pandolf Aug. 1983 24 p
(DA Proj. 3E1-62777-A-879)
(AD-A132263; USARIEM-M-43/83) Avail: NTIS HC A02/MF A01 CSCL 06/19

This study examined the influence that aerobic fitness (V02 max) had on final heat rate (HR), final rectal temperature (Tre), and total body sweat rate (Msw) when subjects exercised while euhydrated and hypohydrated (-5.0% from baseline body weight). Eight male and six female subjects completed four exercise tests both before and after a 10-day heat acclimation program. The tests were a euhydration and a hypohydration exposure conducted in a comfortable (20 C, 40% rh) and in a hot-dry (49 C, 20% rh) environment. Significant differences were not generally found between the genders for HR, Tre and Msw during the tests. In the comfortable environment, HR, Tre and Msw were not generally significantly correlated ($P>0.05$) with V02 max. In the hot-dry environment, Tre and V02 max were significantly correlated ($r=0.58$) when euhydrated before acclimation. Also, HR was significantly related to V02 max before acclimation when eu-($r=-0.61$) and hypohydrated ($r=-0.60$) as well as after acclimation when eu- ($r=-0.57$) and hypohydrated ($r=-0.67$). These data indicate that when euhydrated in the heat, aerobic fitness provides cardiovascular and thermoregulatory benefits acclimation. However, when hypohydrated in the heat, cardiovascular benefits are present for fit subjects both before and after acclimation, but thermoregulatory benefits are not associated with fitness. GRA

N84-14670# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

CONTROL DEVICE MANIPULATIVE BEHAVIOR, AROUSAL AND PERFORMANCE DURING A COMPENSATORY TRACKING TASK M.S. Thesis - New Mexico State Univ.

Hector Michael Acosta Dec. 1980 97 p
(AD-A133921; AFIT/CI/NR-80-83T) Avail: NTIS HC A05/MF A01 CSCL 06/4

This study examined the relationships between control activity, performance and arousal. Experimental non-task load (arousal) manipulations failed to generate significant performance effects, but did reliably affect at least one of three control-activity measures employed, namely, integrated absolute control displacement, IACD. The results offer support for a progression hypothesis. This hypothesis asserts that trends in control activity demonstrated at any given level of performance during skill development are paralleled by trends exhibited as arousal or, at least, non-task stimulation increases. Since performance failed to demonstrate a decrement, a proposed set of related regression hypotheses could not be tested. Author (GRA)

N84-14671# Texas Univ., Austin. Dept. of Chemical Engineering.

MATHEMATICAL SIMULATION OF DIVER PERFORMANCE Final Report, 1 Jul. 1976 - 31 Dec. 1982

Eugene H. Wissler 31 Aug. 1982 13 p
(Contract N00014-76-C-0953)
(AD-A133844) Avail: NTIS HC A02/MF A01 CSCL 06/19

This report summarizes the work accomplished during the six years covered by this contract. A mathematical model of the human thermal system was developed, validated for accuracy under conditions typically encountered in Navy diving operations, and applied to several problems of current interest. The following problems were analyzed: (1) prediction of the performance of a new passive diver thermal protection system developed at NCSC, (2) analysis of the lost bell problem of saturation diving, (3) analysis of heat stress in hyperbaric environments, and (4) prediction of survival time for various accidents involving immersion in cold water. Author (GRA)

N84-14672# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Toxic Hazards Div.

BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS ISSUED BY THE TOXIC HAZARDS DIVISION, 1957-1982

Linda S. Evans, comp., Stephanie A. Moyer, comp., and John A. Moore Aug. 1983 46 p
(AF Proj. 6302)
(AD-A133637; AFAMRL-TR-83-068) Avail: NTIS HC A03/MF A01 CSCL 06/20

The physiological effects of toxic hazards on animals and plant life; the toxic effect of rocket propellants upon the environment; and the environment within spacecraft cabins and its effects on animals were studied. B.G.

N84-14673# Harvard Medical School, Boston, Mass. Dept. of Physiology and Biophysics.

SYMPOSIUM ON MATHEMATICAL MODELING OF CIRCADIAN SYSTEMS Final Scientific Report, 1 May 1981 - 30 Apr. 1982

Martin C. Moore-Ede May 1982 31 p
(Grant AF-AFOSR-0133-81; AF Proj. 2312)
(AD-A133636; AFOSR-83-0851TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is the Final Scientific Report on a Satellite Symposium on the mathematical modeling of circadian systems which was held on June 21, 1981 in conjunction with the Annual Meeting of the Association for the Psychophysiological Study of Sleep in Cape Cod, Massachusetts. The purpose of the satellite symposium was to present and critically review recently developed mathematical models of the circadian timing system, with particular emphasis on human sleep-wake organization, as designed by various investigators from both the United States and abroad who would be invited to participate. GRA

N84-14674# Naval Submarine Medical Research Lab., Groton, Conn.

THE STABILITY OF VISUAL FIELD MEASURES WITH REPEATED TESTING Interim Report

Christine L. Schlichting and Roberto Rodriguez 1 Sep. 1983 10 p
(MR00001)
(AD-A132704; NSMRL-1008) Avail: NTIS HC A02/MF A01 CSCL 14/2

Vitamin supplementation and deficiencies may affect the size of the area in which the human eye can see (visual field). Before using this measure, however, it is important to determine how reliable visual field testing is over several sessions. The size of the visual field was tested in ten subjects on five different days. Subjects with normal vision showed approximately two degrees variation in visual field extent over the sessions. This suggests that the measure can be incorporated in the test protocol designed to study the effect of vitamin supplementation during submarine patrols. Author (GRA)

N84-14675# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.

THE DETECTABILITY OF REPETITIVE, PERIODIC IMPULSES Final Report, 1 Feb. 1980 - 31 Jan. 1983

Richard Horonjeff, Sanford Fidell, and David Green May 1983 61 p
(Contract DAAG29-80-C-0057)
(AD-A132744; BBN-5314; ARO-16729.5-LS) Avail: NTIS HC A04/MF A01 CSCL 06/16

Concern for predicting aural detectability of complex natural sounds has generally focused on steady state tonal and broadband signals. Procedures for calculating detectability of such signals are reasonably well established and validated. Large errors of prediction may occur, however, when these procedures are applied to other classes of signals, such as high crest factor, short duration, impulsive wavetrains. The experimentation described here was intended to support analyses of detection performance that could lead to general quantitative procedures for predicting the audibility of repetitive, periodic impulsive signals. Three separate studies were conducted using similar procedures. The first study quantified the detectability of individual impulses. The second study was directed toward the detectability of multiple impulses of varying periodic repetition rates. The third study explored hypotheses about detection strategies suitable for modelling the audibility of repetitive impulsive wavetrains. GRA

N84-14676# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Behavioral and Social Aspects of Energy Consumption and Production.
ENERGY USE: THE HUMAN DIMENSION
Paul Stern, ed. and Elliot Aronson, ed. Mar. 1983 347 p
(DE84-001405; DOE/NBM-4001405) Avail: NTIS HC A15/MF A01

The nature and determinants of energy consumption, prevention, preparation, and response for energy emergencies and plans for meeting energy needs at the local level are considered. Factors which influence individual and social behavior were analyzed incorporate the human dimension into energy policy. Energy aspects in modern society encompass simultaneously a commodity, an ecological resource, a social necessity, and a collection of strategic materials, but citizens view these one at a time. The potential for improved energy efficiency use is reviewed. DOE

N84-14677# Fondazione Ugo Bordoni, Rome (Italy).
MODEL OF THE BEHAVIOR OF THE HUMAN VISUAL SYSTEM FOR THE PERCEPTION OF CONTOUR ELEMENTS [MODELLO DI COMPORTAMENTO DEL SISTEMA VISVIO UMANO PER LA PERCEZIONE DEGLI ELEMENTI DI CONTORNO]
Roberto Cusani (Rome Univ.), Guido DiBlasio (Rome Univ.), Antonino Orlando, and Filomena Papa Dec. 1982 42 p refs In ITALIAN
(FUB-44-1982) Avail: NTIS HC A03/MF A01

The visual system is modelled as a receiver formed by an element for the processing of the signal (the retina), followed by a transmission channel (optical nerve) and a decision system (the brain cortex) where the boundaries and the lines of the image are recognized. The assumed mechanism, suggested by decision theory, is that of a maximum likelihood estimate in which after the identification of the presence of a contour element a procedure of parameter determination follows. Experimental physiological results are used to determine the numerical parameters which characterize the model. The agreement between model and experiment suggests that the human system works also with a preliminary acquisition followed by a fine data acquisition with dynamic triggering. The required presence of filters which limits the number of different structures that may be identified by the human system suggests the possibility of reduction of the redundancy in the transmission or recording of images. Author (ESA)

N84-14678# Jefferson Medical Coll., Philadelphia, Pa.
ASSESSMENT OF ULTRASONIC B-SCAN IMAGING FOR DETECTION AND QUANTIFICATION OF ATHEROSCLEROTIC LESIONS IN HUMAN CAROTID AND ILLOFEMORAL ARTERIES AND IN ARTERIES OF ANIMALS Annual Report, Apr. 1982 - Apr. 1983
Barry B. Goldberg May 1983 68 p
(Contract N01-HV-2912)
(PB83-261123; NIH-N01-HV-2912) Avail: NTIS HC A04/MF A01 CSCL 06L

The B-Scan Assessment program presents a new challenger for ultrasound in determining its ability to identify and quantify atherosclerotic plaques in the carotid and femoral arteries. As in many modalities of diagnostic implementation in medicine, the state of the art is enhanced by the trial and error experience and repetition. Correlation of B-Scan with arteriogram of the two vessels concerned has demonstrated that time and education could provide essentially a noninvasive workup of a stroke-prone patient. Similarly, patients suffering from claudication clinically arising from diseased femoral arteries might instead be scheduled for a non-invasive study, than initially the invasive arteriogram. GRA

N84-14679# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
HUMAN REACTIONS TO ELF ELECTRIC AND MAGNETIC FIELDS: AN ANNOTATED BIBLIOGRAPHY OF CURRENT LITERATURE, 3RD EDITION Final Report
J. Patrick Reilly Jul. 1983 95 p
(PB83-259648; PPSP/JHU/PPSE-T-27) Avail: NTIS HC A05/MF A01 CSCL 06F

The annotated bibliography lists current literature (since 1960) which applies to human reactions to electric and magnetic fields from 10 Hz to 100 Hz, with an emphasis on power frequency fields. This includes direct experimental work with humans, epidemiological studies, work which use animal studies to draw interferences about human reactions, studies concerning human dosimetry, and works which discuss means for human protection. This volume is an updated version of an earlier bibliography, first published in July 1982, and revised in a second edition in July 1982. Author (GRA)

N84-14680# Health Effects Research Lab., Research Triangle Park, N. C.
BIOLOGICAL EFFECTS OF RADIOFREQUENCY RADIATION: REVIEW DRAFT, PARTS 1, 2 AND 3
Daniel F. Cahill and Joe A. Elder Jun. 1983 611 p refs
(PB83-262550; EPA-600/8-83-026A-Pt-1/2/3) Avail: NTIS HC A99/MF A01 CSCL 06R

The document presents a critical and comprehensive review of the available literature on the biological effects of radiofrequency (RF) radiation through 1980. The objective is to determine whether the existing data base can contribute to the formulation of RF radiation exposure guidance for the general public. Author (GRA)

N84-14681 North Carolina Univ., Chapel Hill.
OXYGEN INSUFFICIENCY AND ENERGY FAILURE IN BRAIN: UNCOUPLING OF OXIDATIVE PHOSPHORYLATION AT LOW OXYGEN CONCENTRATION Ph.D. Thesis
Robert David Pearlstein 1983 106 p
Avail: Univ. Microfilms Order No. DA8316648

The stoichiometry of oxidative phosphorylation at low oxygen concentration < 5 micrometers has been measured in suspension of isolated mitochondria. Employing a steady-state technique in which respiration rate was experimentally controlled by either oxygen or substrate limitation, flux-dependent variation in the phosphorylation efficiency (P/O ratio) of stimulated mitochondrial respiration was evaluated. P/O ratio remained constant over a wide range of respiration rates in mitochondria limited by substrate availability. In contrast, oxygen-limited mitochondria demonstrated a continuous decline in P/O ratio as respiration was increasingly restricted. This unique characteristic is proposed to arise as a consequence of the accumulation of electron in respiratory chain cytochromes. In several experimental settings in which variation in the stoichiometry of oxidative phosphorylation was demonstrated, intra-mitochondrial electron density was the only variable uniformly correlating with phosphorylation efficiency. Dissert. Abstr.

N84-14166# Joint Publications Research Service, Arlington, Va.
THE 5TH SYMPOSIUM ON GRAVITATIONAL PHYSIOLOGY
In its USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 82-84 Transl. into ENGLISH from Med. (Moscow), 27 Jul. 1983 p 3 Symp. held in Moscow; sponsored by the International Union of Physiological Sciences (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-14682# Materials Research Labs., Melbourne (Australia).
A PRELIMINARY ASSESSMENT OF OBSERVER EXPECTA-

TIONS IN TARGET DETECTION TASKS
C. J. Woodruff and G. S. M. Webb Jul. 1983 40 p refs
(MRL-R-893; AR-003-306) Avail: NTIS HC A03/MF A01

The determination of soldiers' expectations as to what target features would cause detection of stationary MII3 vehicles was examined. Results show that a scenario procedure is appropriate. A factor analysis of the expectations scales isolated four factors underlying the communality of these scales; however, there is considerable unique variance associated with each scale. The interpretation of these factors is discussed, and modifications to the scenario scales for future use are outlined. Results of an attempt to collect data on actual causes of detection during a live exercise show that such data cannot be effectively gathered under these conditions. Author

N84-14683# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
TRAINING FEEDBACK HANDBOOK Final Report, Sep. 1982 - Jan. 1983
Billy L. Burnside, Bob G. Witmer, and Donald M. Kristiansen Jan. 1983 87 p
(DA Proj. 2Q2-63743-A-794)
(AD-A132565; ARI-RP-83-7) Avail: NTIS HC A05/MF A01 CSCL 05/9

This handbook is designed to assist training developers and evaluators in structuring their collection of feedback. Six methods of collecting feedback are described, and practical guidelines for their application are offered. Issues in the management and analysis of feedback are also discussed. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-14684# Joint Economic Committee (U. S. Congress).
THE IMPACT OF ROBOTICS ON EMPLOYMENT
Washington GPO 1983 34 p Hearings before the Subcomm. on Econ. Goals and Intergovt. Policy of the Joint Econ. Comm., 98th Congr., 1st Sess., 18 Mar. 1983
(GPO-21-160) Avail: Subcommittee on Economic Goals and Intergovernmental Policy

The prospective impact of robotics on employment in the U.S. are evaluated. Robotics refers to the use of sophisticated programmable or computer-controlled robots to perform routine and repetitions tasks. Supplying the number of trained assemblers, technicians, maintenance personnel, programmers, and operators is addressed. Effects on employment are also addressed. N.W.

N84-14685# Illinois Univ., Urbana. Engineering Psychology Research Lab.
THE EFFECTS OF TASK STRUCTURES, DYNAMICS OF DIFFICULTY CHANGES, AND STRATEGIC RESOURCE ALLOCATION TRAINING ON TIME-SHARING PERFORMANCE
Pamela Tsang and Christopher D. Wickens Oct. 1983 53 p
(Contract N00014-79-C-0658; NR Proj. 196-158)
(AD-A134112; EPL-83-3/ONR-83-3) Avail: NTIS HC A04/MF A01 CSCL 05/5

A distinction was made between two aspects of time-sharing performance: time-sharing efficiency and attention allocation optimality. The first one is concerned with the level of joint performance of the time-shared tasks. The second one is concerned with the consistency of protecting the high priority task from variations in the task demand. Time-sharing performance was then evaluated as a function of: the task structures of the component time-shared tasks and the strategic training of resource allocation. Time-sharing efficiency was observed to decrease with an increasing overlap of resources that the time-shared tasks utilized. Results also tend to support the hypothesis that resource allocation is more optimal when the time-shared tasks placed heavy demand on common processing resources than when they utilize separate resources. The verbal strategy instructions employed to induce more optimal allocation were more successful for the task pairs utilizing common resources than for those utilizing separate resources. GRA

N84-14686# Illinois Univ., Urbana. Engineering-Psychology Research Lab.
PROCESSING PHENOMENA AND THE DISSOCIATION BETWEEN SUBJECTIVE AND OBJECTIVE WORKLOAD MEASURES
Michael D. Vidulich and Christopher D. Wickens Oct. 1983 46 p
(Contract N00014-79-C-0658)
(AD-A134050; UILU-EPL-83-2/ONR-83-2) Avail: NTIS HC A03/MF A01 CSCL 05/5

Causes of dissociation between subjective workload assessments and objective performance were investigated. A Sternberg memory search task was utilized. Sternberg task configurations varied in the automaticity of performance, stimulus presentation rate, discernability of stimuli, and the value of good performance. Automaticity in Sternberg task performance was manipulated by using two independent sets of stimuli; one of which was consistently mapped (i.e., targets were always the same) while the other was inconsistently mapped (i.e., targets changed over trials). Also, all Strenberg configurations were performed both as single tasks and as part of dual task combinations (with a manual control task). During testing subjects rated all trials on eight typical bipolar rating scales. The results were interpreted as supporting cognitive-processing-based experimentation in subjective workload assessment aimed at identifying differences between the cognitive processing accounting for subjective assessments and those processes that produce performance. GRA

N84-14687# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A SERVO CONTROLLED RAPID RESPONSE ANTI-g VALVE
Richard J. Crosbie 17 Oct. 1983 19 p
(W0584)
(AD-A134042; NADC-83087-60) Avail: NTIS HC A02/MF A01 CSCL 09/5

Current anti-G suits inflate under control of an anti-G valve and apply pressure to the abdominal and leg areas to prevent blood pooling in the lower portions of the body. The anti-G valves employ a spring and mass construction which regulates air flow to the suit in direct proportion to the amount by which the applied G force exceeds a nominal 2G breakout force. This mechanical method, however, does not permit rapid filling of the suit required during high onset G profiles generated by high performance VA/VF aircraft. This Center has designed, constructed, and tested a prototype servo controlled rapid response anti-G valve system. This system, which employs a pressure transducer located in the valve outlet line but modified to represent the pressure in the anti-G suit as the feedback signal, is capable of pressurizing the suit on a schedule which closely coincides with that of a rapidly applied G profile. In addition, this new valve is capable of improved system reliability. A series of manned tests were conducted on the NAVAIRDEVCEN human centrifuge to compare the protection provided to relaxed and straining subjects exposed to rapid onset G-profiles by the current mechanical valve system and the servo valve system. The servo valve system proved superior to the mechanical system exhibiting an average 0.5G tolerance improvement when the subjects were in a relaxed state and an average 1.3G tolerance improvement when the subjects were in an M-1 straining state. GRA

N84-14688# Naval Health Research Center, San Diego, Calif.
MINICOMPUTER ADMINISTERED TASKS IN THE STUDY OF EFFECTS OF SUSTAINED WORK ON HUMAN PERFORMANCE Interim Report
David H. Ryman, Paul Naitoh, and Carl E. Englund Aug. 1983 11 p

(AD-A133670; NAVHLTHRSCHC-83-21) Avail: NTIS HC A02/MF A01 CSCL 05/10

The measurements of changes in human performance during laboratory studies of long-term (sustained) continuous work periods has been greatly facilitated with the introduction of computer administered and scored tasks. This report documents six minicomputer administered tasks and their scoring programs which have been successfully used in the Sustained Operations research program at the Naval Health Research Center. The minicomputer system used in these studies was a MINC-11 (Modular Instrumentation Computer from Digital Equipment Corporation) configured with A/D converter clock modules, two terminals and a printer. The tasks were selected for measurement sensitivity to sleep loss and fatigue. Four of these tasks involved measures of different types of reaction times. The TRAP tasks measured the response times of alternate pressing of two buttons; the Simple Reaction Time task recorded response times to a visual stimulus; the Alpha-Numeric Visual Vigilance task measured response latencies to correct and incorrect (disjunctive) visual signal detections, and the Four Choice Serial Reaction Time task measured reaction time involving correctness of choice to a visual stimulus in one of four areas on a terminal screen. Two other tasks prevented via computer were the Logical Reasoning Task, measuring correctness of complex information processing, and a Mood-Symptom-Fatigue and physiological state survey. The task programs were written in assembly language (MACRO-11), and the scoring-listing programs in Fortran IV. The programs have been run on MINC-11/03 and 11/23 computers, with two double-density disk drives.
GRA

N84-14689# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE ABILITY TO PROCESS ABSTRACT INFORMATION M.S. Thesis
Michael L. Moroze Sep. 1983 91 p
(AD-A133794; AFIT/CI/NR-83-51T) Avail: NTIS HC A05/MF A01 CSCL 05/8

The increasing use of technology in human-machine systems has brought about the need to determine how the introduction of sophisticated technology impacts the human's performance. How this technology interacts with the stress, workload, and information processing capacity of the individual is discussed. The technology discussed is based on the use of advanced flight displays, particularly the Head-Up Display, in the aircraft environment. A study was conducted using three different methods of displaying the flight information to the operator. It was found that, although all subjects could perform their flight tasks within pre-determined criteria, under a loading condition performance using a relatively abstract presentation style was significantly poorer than performance using a more traditional, relatively concrete presentation style.
Author (GRA)

N84-14690# Battelle Columbus Labs., Ohio.
CARBON DIOXIDE SENSOR TECHNOLOGY Final Report
A. A. Boiarski, P. P. Balog, R. H. Barnes, H. J. Byker, G. B. Gaines, and P. S. Riegel Apr. 1983 85 p
(Contract N61331-82-C-0024; S0394SL)
(AD-A133688; AD-F200054; NCSC-CR-102-83) Avail: NTIS HC A05/MF A01 CSCL 06/11

The current state of the art of carbon dioxide sensing technology was examined in this task. It was found that no current system can meet the desired requirements. However, several approaches were identified which show promise. The overall summary of approach used to identify the promising sensor concepts is provided in this section along with the basic conclusions that were reached regarding available sensor techniques. Overall recommendations are also summarized below to provide NCSC guidance regarding their consideration of future efforts.
Author (GRA)

N84-14691# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
PICKING UP AN OBJECT FROM A PILE OF OBJECTS
Katsushi Ikeuchi, Berthold K. P. Horn, Shigemi Nagata, Tom Callahan, and Oded Feingold May 1983 29 p
(Contracts N00014-80-C-0505; N00014-77-C-0389)
(AD-A133631; AI-M-726) Avail: NTIS HC A03/MF A01 CSCL 06/4

This paper describes a hand-eye system we developed to perform the bin-picking task. Two basic tools are employed: the photometric stereo method and the extended Gaussian image. The photometric stereo method generates the surface normal distribution of a scene. The extended Gaussian image allows us to determine the attitude of the object based on the normal distribution. Visual analysis of an image consists of two stages. The first stage segments the image into regions and determines the target region. The photometric stereo system provides the surface normal distribution of the scene. The system segments the scene into isolated regions using the surface normal distribution rather than the brightness distribution. The second stage determines the object attitude and position by comparing the surface normal distribution with the extended-Gaussian-image. Fingers, with LED sensor, mounted on the PUMA arm can successfully pick an object from a pile based on the information from the vision part.
Author (GRA)

N84-14692# Civil Aeromedical Inst., Oklahoma City, Okla. Civil Aeromedical Inst.
AN ANALYSIS OF POTENTIAL PROTECTIVE BREATHING DEVICES INTENDED FOR USE BY AIRCRAFT PASSENGERS
D. deSteiguer and J. T. Saldivar May 1983 41 p
(AD-A132648; FAA-AM-83-10) Avail: NTIS HC A03/MF A01 CSCL 06/11

This report presents the results of tests performed to examine concepts for the development of a passenger-type protective breathing device which would provide protection from toxic smoke/fumes produced during an in-flight fire and afford some protection during emergency evacuations. Data examined include expiratory PO2, PN2, PCO2; inspiratory PCO2; respiratory rates; and respiratory volume for the devices tested.
GRA

N84-14693# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Industrial Engineering.
COMPUTER AIDED TECHNIQUES FOR CREW STATION DESIGN, WORK-SPACE ORGANIZER-WORG, WORKSTATION LAYOUT GENERATOR-WOLAG
Babur Mustafa Pulat Jun. 1983 39 p
(Contract N00014-81-C-0320; NR Proj. 196-168)
(AD-A132981) Avail: NTIS HC A03/MF A01 CSCL 05/5

This study reports the development of two more modules in the Multi-Man-Machine Work Area Design and Evaluation System-MAWADES. The Work-space Organizer-WORG, and the Workstation Layout Generator-WOLAC. WORG is an interactive computerized model, which prepares the layout of several workstations within a work-space. The relative locations of the workstations are determined after link analysis (visual, voice and electronic communication) between stations. WOLAG is also a computerized interactive model, designed to prepare layouts at each station for sit-stand duty. Displays and controls are laid out sequentially on a panel based on system functions and operator tasks. The physical dimensions of the panel, along with panel sections and angles between sections, are determined after consideration of workspace geometry (anthropometric variables), the visual space (visual field, eye-head movements, etc.), and locational priority zones. Both modules collect evaluative measures on the designs generated. This data may be analyzed by a decision maker to choose the best design.
GRA

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-14694# Stanford Univ., Calif. Systems Optimization Lab.
GENERATION OF FEASIBLE DESCENT DIRECTIONS IN CONTINUOUS TIME LINEAR PROGRAMMING
Kurt M. Anstreicher Sep. 1983 91 p
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; Grants NSF MCS-81-19774; NSF MCS-79-26009; NSF ECS-80-12974)
(DE84-002506; SOL-83-18) Avail: NTIS HC A05/MF A01

The continuous time linear programming (CTLP) problem provides a unified formulation for a number of linear, constrained, dynamic optimization problems. An algorithm is presented for the CTLP basis inversion problem which is simple, numerically stable, and convenient for formal analysis. The basis inverse is then applied to solve the CTLP representation and pricing problems in a systematic manner. Using a new relationship between primal representation and dual repricing, a CTLP degenerate pivoting algorithm is derived which enlarges the class of problems to which the CTLP descent algorithm may be applied. Degenerate pivoting occurs in a induced semi-finite ordinary LP, and may be viewed as the first rigorous implementation of point-pair analysis in continuous programming. Under a mild regularity condition, degenerate pivoting terminates with revised prices indicating optimality, or a feasible descent direction in the form of multiple nonbasic variables to be simultaneously introduced. A small example indicates that failure of the regularity condition is closely related to the failure of CTLP strong duality. DOE

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N84-14695# South African Inst. of Civil Engineers, Pretoria. Construction Div.
SYMPOSIUM ON COMPUTERS IN CONSTRUCTION
1982 151 p refs Symp. held in Pretoria, 29 Sep. 1982
(CSIR-S-285; ISBN-0-7988-2366-6) Avail: NTIS HC A08/MF A01

The utilization of computers in the construction industry is discussed. The management of construction operations, financial management, and planning and scheduling task are addressed. For individual titles, see N84-14696 through N84-14706.

N84-14696# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
INFORMATION SYSTEMS DESIGN IN CONSTRUCTION MANAGEMENT
M. C. Vorster *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 11 p refs (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

Some ideas and impressions about the human aspects of information systems design are presented. It is shown that many of the lessons learned from the relationship between owner architect and contractor must be applied in the design of information systems. It is stressed that success relies heavily on the individual manager's ability to produce a design brief, recognizing the objectives of his/her organization. The key role of accurate data is emphasized. M.G.

N84-14697# Umgeni Water Board, Pietermaritzburg (South Africa).
INTEGRATED BUDGET CONTROL USING A DESKTOP COMPUTER
R. F. Phelines and A. E. Carlisle *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 15 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

A computerized accounting system enabling management to monitor income and expenditure on cost heads against monthly budget is described. The handling of planning expenses, the distribution of overheads, the inclusion of unpaid financial commitments and the distribution of interest accrued on monies loaned but not allocated, allow realistic costs to be determined for each selected cost head and for variances against budget to be identified. The system is flexible and can be adapted to accommodate any details of monthly income and expenditure which management wishes to identify. M.G.

N84-14698# Computer Applications Bureau (Pty) Ltd. (South Africa).
COMPUTERISED PLANT CONTROL SYSTEM
R. A. Border *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 12 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

The effectiveness of a comprehensive system for controlling plant, machinery or vehicle revenue and expenditure is discussed. The advantages of the system are: flexibility in allowing the user to determine the level of detail he needs for analyzing costs; the accumulation of historic information including quantities and values for actual and budget figures; comparative analyses of similar plant items measured in return or cost per hour; the integration of the system with other systems such as invoicing, creditors, debtors, payroll, cost ledger, financial ledgers and asset registers; and comprehensive system for simplifying the preparation of budgets. M.G.

N84-14699# California Univ., Berkeley.
INTEGRATED BID ESTIMATE SYSTEMS FOR CONTRACTORS
Richard A. Appuhn *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 9 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

An integrated bid estimating system which is designed for use either on medium or large interactive or data based systems is described. The basic parameters on which the bid estimate is based and the method by which resources are defined and utilized for the preparation of the bid estimate are discussed. The information thus obtained may then be merged into a larger and more general integrated information system for effective project management. M.G.

N84-14700# Brett Schachat Associates, Johannesburg (South Africa).
TENDERING ON A MICRO COMPUTER
S. F. Brett *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 16 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

The development of a decentralized microcomputer system for the rapid and accurate calculation of tender prices is described. Due to the nature of construction, with the wide variety of possible components in a building, a special generalized technique had to be developed to cater for all possibilities. Another aspect important in the design of the system was that the information on which the tender was based could be used for the on-going control of costs on the project. The system was developed while in a live contracting environment and is based firmly on quantity surveying rather than accounting principles. The system does not replace the accounting approach but rather, through future development, will link in to a computerized accounting system. At that stage the system will provide a complete analysis of actuals against allowables for each item of work as the project progresses. M.G.

N84-14701# HKC Systems (Pty) Ltd. (South Africa).
SITE COMPUTERS

P. Kipps *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 8 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

The drop in price and increase in sales of microcomputers has resulted in many of them finding their way onto construction sites. The reasons why this is now a viable proposition are discussed. The installation of a computer on a construction site is described. Some of the factors involved in the centralization/decentralization debate are discussed. Author

N84-14702# IBM S.A. Proprietary Ltd., Johannesburg (South Africa).
KEEPING YOUR FINGERS CROSSED WON'T HELP
Simon Gers *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 7 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

With todays fluctuating economy, skill shortages and the rising costs of labor, plant and material, construction management needs to be able to utilize the power of a computer himself without obtaining the necessary computer skills in order to obtain the necessary information to maintain control of his business and enable him to make the best decisions as and when the need arises in his day to day activities relating to: plant management; estimating and tendering; measurement and certificates; cost and valuation control; project planning and scheduling; etc. Author

N84-14703# Starke (Basil) (Pty) Ltd., Cape Town (South Africa).
COMPUTERS FOR THE SMALLER CONTRACTORS
N. Marsh *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 12 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

Suggestions are presented to assist the small to medium civil engineering contractor in assessing the possibility of introducing computerized systems into the organization. A general study is made of the need and advantages of such a course of action. Some of the systems that can effectively be computerized with a distinct benefit to the user are identified. The numerous alternative methods of computerization are also discussed with a view enabling the user investigate which of these options will best suit his individual needs. Finally, a working example of computerization in a medium sized company is described together with some of the difficulties encountered in the implementation of the system. M.G.

N84-14704# South African Inst. of Civil Engineers, Pretoria.
COMPUTER SIMULATION OF CONSTRUCTION OPERATIONS
G. A. Victor (Construction Information Systems) *In its* Symp. on Computers in Construction 1982 14 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

A computer based system which simulates operations such as earthmoving, tilt up construction, concrete placing, and high rise building erection is described. Simulation provides a powerful tool to enable a manager to better analyze and improve operations. Eventually, the technologies and methods described will provide the basis for real time monitoring of field operations, and partial automation of some processes. Author

N84-14705# South African Inst. of Civil Engineers, Pretoria.
IS CRITICAL PATH PLANNING THE ANSWER
A. Fleischmann (Critical Path Planning Services) *In its* Symp. on Computers in Construction 1982 20 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

The development of an inhouse computer to provide integrated budget control and cash flow forecasting facilities including inflation forecasts is discussed. The programs had to have a direct link to an additional critical path suite of programs. Past and current project management industry trends and problems are analyzed and the system design criteria and management objectives are defined highlighting the interaction of inflation, time, cost and management strategy. Examples of solutions which take cognizance of these factors are included. Author

N84-14706# Pro-Crit (Pty) Ltd., Randburg (South Africa).
CONSTRUCTION PLANNING AND CONTROL: CURRENT PRACTICE AND CONTINUING CHALLENGES
L. S. Stapelberg *In* South African Inst. of Civil Engineers Symp. on Computers in Construction 1982 16 p (For primary document see N84-14695 05-60)
Avail: NTIS HC A08/MF A01

Computer systems in the field of construction planning and control have largely failed to effect the quality of managerial performance in the construction industry. The problem of 'optimization' versus 'implication analysis' is discussed as a reflection on a possible solution. Critical issues in the design criteria for construction planning systems are discussed with reference to the environment which stimulates their importance. M.G.

N84-14707# Naval Postgraduate School, Monterey, Calif.
MICROCOMPUTER NETWORKING: A CP/M-BASED APPLICATION M.S. Thesis
Thomas M. Carnahan and Michael K. Waters Sep. 1983 146 p (AD-A134124) Avail: NTIS HC A07/MF A01 CSCL 09/2

This thesis examines a topology and protocol for interconnection of microcomputers to allow them to communicate with each other. An application is offered based on the CP/M operating system and other industry standards. A low-cost hardwired implementation for connecting microcomputers is provided with software to allow file transfers. The implementation was developed by redesigning and assimilating existing software utilizing modern software engineering techniques. Author (GRA)

N84-14708# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
AN ARGUMENT FOR SOFT LAYERING OF PROTOCOLS M.S. Thesis
Geoffrey Howard Cooper May 1983 121 p
(Contract N00014-75-C-0661)
(AD-A133948; MIT/LCS/TR-300) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis is about the efficiency of protocol layering. It examines the technique of protocol layering in an abstract way and finds two major sources of inefficiency in protocol implementations which are caused by the imposition on them of a layered structure. The conventional approach to making layered protocol implementations run efficiently - for avoiding the sources of inefficiency discussed herein - are all independent of the protocol specification, and thus all decrease the value of the protocol specification as a guide for implementing protocols. The author introduces a new means of avoiding the problems of layered protocol implementations which operates within the domain of the protocol specification. He allows an increase in the flow of state information between the layers of a layered protocol implementation in a very controlled manner, so as to decrease the modularity of the protocol architecture as little as possible. The increased flow of information is specified in the protocol specification as a model of all the layered protocols that use the protocol being specified, called the usage model. Since this approach decreased the rigidity of the layered structure without entirely eliminating it, it is coined the term Soft Layering for the approach. GRA

N84-14709# Naval Postgraduate School, Monterey, Calif.
GENERAL PURPOSE ELECTRONIC TEST EQUIPMENT (GPETE) ACQUISITION CONSIDERATIONS FOR AUTOMATED CALIBRATION M.S. Thesis
William D. Stahler Jun. 1983 126 p
(AD-A133865; NPS54-83-002) Avail: NTIS HC A07/MF A01 CSCL 09/2

Calibration is a vital logistics element that directly impacts operational readiness and mission capability. Declining manpower resources and fleet expansion necessitate improvements in calibration productivity. The Navy has initiated several calibration automation programs. Realization of the full potential of automated calibration systems requires that the test instrument be IEEE-488 general purpose interface bus (GPIB) configured. This thesis examines the relative costs and benefits of configuring general purpose electronic test equipment (GPETE) with GPIB to facilitate automated calibration. It does so through the development of a simple cost-benefit analysis and a discussion of non-quantifiable advantages and disadvantages, based upon extensive interviews with experts and literature research. In general, the analysis supports GPIB procurement when procurement quantities are large, calibration procedures are lengthy, and/or the calibration interval is short. GRA

N84-14710# Naval Postgraduate School, Monterey, Calif.
DESIGN OF RELATIONAL DATABASE BENCHMARKS M.S. Thesis
Vincent Courtney Stone Jun. 1983 113 p
(AD-A133651) Avail: NTIS HC A06/MF A01 CSCL 09/2

Performance measurements of a database machine reflect not only the processing power of the machine, but also the size and structure of the database. It is therefore useful to construct databases for performance measurements of database machines. Furthermore, it is useful to utilize synthetic data, such that the volume of the reply can be predicted for a given query and the structure and attributes of the database can be varied for intended test queries. Conducting measurement studies using a synthetic database contributes to the generality of the results when different test queries are employed. A parameterized program is described herein which can be used to generate various relations for a synthetic database. The experiences in constructing and using the database generator are described. It is suggested that given sufficient information on real-world databases the generator may be useful for modeling them as well as for creating databases for benchmark tests. Author (GRA)

N84-14711# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.
TECHNICAL AND ECONOMIC ANALYSIS OF THE PLANNED VISUAL DISPLAY TERMINAL EMPLOYMENT FOR THE STOCK POINT LOGISTICS INTEGRATED COMMUNICATIONS ENVIRONMENT (SPLICE) M.S. Thesis
Samuel E. James Jun. 1983 81 p
(AD-A133642) Avail: NTIS HC A05/MF A01 CSCL 09/2

The Stock Point Logistics Integrated Communications Environment (SPLICE) concept is designed to augment the existing Navy Stock Point and Inventory Control Point ADP facilities, in response to increasing demands for data processing, within the scope of a decentralized telecommunications environment. This thesis provides a critical review of the existing plan for employment of Visual Display Terminals (VDTs) within the SPLICE concept. VDT employment considerations are examined and alternative VDT employment options are presented. A technical and economic analysis is performed for both the planned and proposed alternative VDT equipment and employment options. Recommendations based on these findings are then presented. Author (GRA)

N84-14712# Litton Mellonics Systems Development Div., Fort Benning, Ga.
PRELIMINARY EVALUATION OF THE LIGHT PEN AS THE KEY COMPONENT IN A MICROCOMPUTER-BASED SIMULATOR
James E. Schroeder and W. Alfred Cook, Jr. Sep. 1983 25 p
(Contract MDA903-80-C-0345; DA Proj. 2Q2-63743-A-794)
(AD-A132596; ARI-RN-83-31) Avail: NTIS HC A02/MF A01 CSCL 20/6

The Army Research Institute has developed a low-cost, microcomputer-based, part-task trainer named MACS (Multipurpose Arcade Combat Simulator). The key hardware provides the microcomputer with X and Y coordinates signifying where the light pen was aimed at that moment. The purpose of the present research was to conduct a preliminary evaluation of the reliability of the light pen and determine the extent that some real-world variables influence it (e.g., ambient light, glare, distance from the monitor to the light pen, etc.). The reliability of the light pen was found to vary widely depending on the conditions of the test. The most important finding was an interaction between screen brightness and location on the screen in their joint effect on light-pen reliability. The light pen's reliability was found to be unaffected by some of the variables (e.g., ambient light and trigger switch closure). The results of these test will provide valuable information about the hardware and/or software changes needed to maximize the reliability of the MACS system. Author (GRA)

N84-14713# Navy Personnel Research and Development Center, San Diego, Calif.
METHODS FOR IMPROVING THE USER-COMPUTER INTERFACE Progress Report, Feb. 1981 - Dec. 1982
Patrick H. McCann Aug. 1983 21 p
(SF57525001)
(AD-A132657; NPRDC-TR-83-29; REPT-17-83-8) Avail: NTIS HC A02/MF A01 CSCL 05/8

Numerous examples have been cited of deficiencies in the user-computer interface on Navy computers, both ashore and aboard ship. The computer system designer often overlooks the user's perspective in his desire to provide the user with a system that is a faster and more powerful tool. In this document requirements of the personal computer user are identified and contrasted with computer designer perspectives towards the user. The user's psychological needs are described so that the design of the user-computer interface may be designed to accommodate them. Development of the user-computer interface is discussed in terms of the user's physical, perceptual, and conceptual contacts with the system. The ideals of system design - transparency and visibility to the user - are described. Further research is suggested that will explore the characteristics of efficacious menu selection, develop a theory of the operator, determine the best locus of control for dialogue features, provide guidelines for improving system documentation, and improve user work station habitability. GRA

N84-14714# Temple Univ., Philadelphia, Pa.
IMPLEMENTING AN ADA KERNEL ON NEBULA Final Report, 15 Mar. 1981 - 31 Oct. 1982
Giorgio P. Ingargiola Aug. 1983 66 p
(Contract DAAG29-81-K-0059)
(AD-A132745; ARO-18023.1-EL-R) Avail: NTIS HC A04/MF A01 CSCL 09/2

NEBULA and Ada are rapidly approaching use. These have been designed to achieve similar goals, to improve the quality, timeliness, and cost of the real-time systems used in the Department of Defense. NEBULA is intended to provide a common architecture for these systems in applications that range from microprocessors to mainframes. Ada is designed, among other things, to ease concurrent programming. This report reviews the concurrency features of Ada, examines the aspects of the NEBULA architecture that are more significant for the implementation of concurrent programs, suggests a method for reducing the tasking mechanisms of Ada to a few simple kernel operations, and evaluates the NEBULA architecture in terms of this method and these operations. It is found that NEBULA supports admirably the control structures of Ada, but its Memory Management system is not very suitable. Entry calls and Accept statements are found to require about 40 machine instructions each. A simple rendezvous requires the execution of over 100 instructions. GRA

N84-14715# Naval Postgraduate School, Monterey, Calif.
INTEL 432/670 ADA BENCHMARK PERFORMANCE EVALUATION IN THE MULTIPROCESSOR/MULTIPROCESS ENVIRONMENT M.S. Thesis
Theodore F. Rogers, Jr. and Ioannis A. Karadimitropoulos Jun. 1983 140 p
(AD-A132774) Avail: NTIS HC A07/MF A01 CSCL 09/2

The INTEL 432/670 microcomputer system contains the iAPX 432 microprocessor which executes compiled Ada programs. This thesis contains performance evaluation of the INTEL 432/670 system in a multiprocessor/multiprocess environment. Benchmark programs from the Computer Family Architecture study are encoded in the Ada Programming Language and compiled on a host VAX 11/780 before being download to INTEL MDS 800 for further transfer to the INTEL 432/670 system for execution. The historical development of computer architectures as well as a systematic description of the INTEL 432/670 system are included. GRA

N84-14716# Office of the Under Secretary of Defense for Research and Engineering, Washington, D. C.
DEPARTMENT OF DEFENSE COMPUTER TECHNOLOGY. A REPORT TO CONGRESS
Aug. 1983 140 p
(AD-A132899) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report contains the results of an internal DoD study of mission-critical computer technology at the direction of Congress through the Fiscal Year 1983 Defense Authorization Act. The study was commissioned to address the following specific issues: The applicability of commercial computer technology (including, but not limited to computer hardware, semiconductors and associated Instruction Set Architectures (ISAs) to Defense Department missions; The desirability of standardizing at the ISA level in light of alternative approaches; The degree of software transportability (transferring computer programs from one computer to another) that the various approaches permit and how each approach would affect Department of Defense hardware/software logistics and costs of ownership; The relative merits and liabilities involved in the incorporation of each approach into Department of Defense weapons systems; Justification for all on-going Service computer development projects; and A plan to reduce the proliferation of these computers. GRA

N84-14717# Air Force Human Resources Lab., Brooks AFB, Tex.
REAL VISUAL IMAGE COMPENSATION FOR HEAD MOTION PARALLAX EFFECTS AS A FUNCTION OF OBJECT DISTANCE Final Technical Paper
James M. Duff Sep. 1983 8 p
(AF Proj. 2363)
(AD-A132915; AFHRL-TP-83-37) Avail: NTIS HC A02/MF A01 CSCL 09/2

Parallax effects due to head movement cause an apparent shift of an object in an image plane. The magnitude of this shift can be determined by a simple geometric formula. Using this relationship, a real image display could provide parallax compensation similar to that of a virtual image display. GRA

N84-14718# Naval Postgraduate School, Monterey, Calif.
THE USE OF A MICROCOMPUTER SYSTEM AS AN AID TO CLASSICAL AND DIGITAL CONTROL SYSTEM DESIGN AND ANALYSIS Thesis
John Douglas Humphrey Jun. 1983 170 p
(AD-A132945; AD-E800795) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis takes five FORTRAN RIV programs from Computer Programs for Computational Assistance in the Study of Linear Control Theory and translates them into a microcomputer BASIC language to run on an inexpensive microcomputer system. Three of the five programs are state variable programs. They are BASMAT for basic matrix manipulation, RTRESP for rational time response, and GTRESP for graphical time response. Two are transfer function programs, FRESP for frequency response and RTLOC for root locus. A user's guide and example are included for each. A final example is used to demonstrate the utility of the two transfer function programs as an aid to direct digital design in the w'-plane. GRA

N84-14719# Brookhaven National Lab., Upton, N. Y.
MEMORY INTENSIVE FUNCTIONAL ARCHITECTURE FOR DISTRIBUTED COMPUTER CONTROL SYSTEMS
D. G. Dimmler Oct. 1983 7 p refs Presented at Nucl. Sci. Symp., San Francisco, 19 Oct. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002579; BNL-33736; CONF-831015-13) Avail: NTIS HC A02/MF A01

A memory intensive functional architecture for distributed data acquisition, monitoring, and control systems with large numbers of nodes was conceptually developed and applied in several large scale and some smaller systems. This discussion concentrates on: (1) the basic architecture; (2) recent expansions of the architecture which now are feasible in view of the rapidly developing component technologies in microprocessors and functional large scale integration circuits; and (3) implementation of some key hardware and software structures and one system implementation which is a system for performing control and data acquisition of a neutron spectrometer at the Brookhaven High Flux Beam Reactor. The spectrometer is equipped with a large area position sensitive neutron detector. DOE

N84-14720# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
COMPUTER GRAPHICS HARDWARE AND SOFTWARE OF THE HP 1000F SYSTEM [HARDWARE E SOFTWARE GRAFICO DEL SISTEMA HP 1000F ISFI]
P. Cerulli-Irelli Jul. 1983 40 p In ITALIAN
(IFSI-82-8) Avail: NTIS HC A03/MF A01

The system described includes three graphics terminals: a drum plotter, an XY plotter and a graphics color video terminal. The characteristics of the terminals and their subroutines and a general use graphics library for the control of those terminals are described. It was derived from the Device-Independent Graphics Library originally provided by HP for the XY plotter. Author (ESA)

N84-14721# Office of Software Development, Falls Church, Va. Federal Conversion Support Center.
DIFFERENCES IN COBOL SYNTAX BETWEEN VENDORS' IMPLEMENTATIONS Final Report
May 1983 142 p refs
(PB83-263392; OSD/FCSC-83-005) Avail: NTIS HC A07/MF A01 CSCL 09B

Five vendors were explored: Burroughs Corporation, Control Data Corporation, Honeywell Information systems, IBM Corporation, and Sperry Univac Corporation. The implementor-defined syntax, major extensions, compiler options and parameters, carriage control characters, and reserved words for each vendor are discussed. GRA

N84-14722# Federal Compiler Testing Center, Washington, D.C. Federal Software Testing Center.
STRATUS COMPUTER, INC. STRATUS 32, VOS COBOL RELEASE 2.5 Validation Summary Report
13 Jul. 1983 67 p
(PB83-262378; OSD/FCSC-83-225) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Stratus Computer, Inc., VOS Release 2.5 running under the VOS Release 2.5 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-14723# Federal Compiler Testing Center, Washington, D.C. Federal Software Testing Center.
IBM CORPORATION IBM 4341, VS FORTRAN RELEASE 3.0 Validation Summary Report
1 Jul. 1983 13 p
(PB83-257998; OSD/FSTC-83-220; FIPS-PUB-69) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the IBM Corporation, VS FORTRAN Release 3.0 running under the VM/SP Release 1.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-14724 Minnesota Univ., Minneapolis.
FAULT DETECTION USING ABSTRACTED MODELS OF FINITE-STATE MACHINES Ph.D. Thesis
Konstantinos Nikolaou Oikonomou 1983 360 p
Avail: Univ. Microfilms Order No. DA8318109

One approach to fault tolerance in computer systems is the use of one machine to monitor the behavior of another. From a general viewpoint, the problem is to detect fault in a complex system when the observations possible on it and the observer's knowledge of its correct behavior are limited. This problem is studied here by representing the monitored system S by a finite-state machine (fsm): the following questions arise in this setting, and are examined (Q1) Investigate the fundamental limits to fault detection in an fsm M observed through A, and whose correct behavior is known as M (sub A). (Q2) Given a complex system model M and a desired 'abstraction ratio' find an optimal abstraction A for fault detection. (Q3) Extend modelling and fault detection results to systems of interconnected fsm's, representing distributed computer systems. Dissert. Abstr.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-14725 North Carolina Univ., Chapel Hill.
A CASE GRAMMAR APPROACH TO ERROR CORRECTION IN COMPUTER PROGRAMS Ph.D. Thesis
Judy Mallino Popelas 1983 339 p
Avail: Univ. Microfilms Order No. DA8316653

A programming language grammar and a corresponding analysis method based on the use of attribute and significant keyword information are described. The grammar is referred to as a case grammar, and the analysis method as case analysis. Their use results in a significant ability to correct syntactic errors in computer programs. A case grammar defines a programming language in terms of its objects, and its objects in terms of their attributes. It consists of two parts. The first part, the access form dictionary, defines ways of accession objects in the language in terms of other objects in the language. The second part of a case grammar, the verb dictionary, specifies the objects required by each verb of the language, and the functional or case relationship of each object to its verb. Entries in the verb and access form dictionaries are referred to as case and form frames, respectively. The case analysis algorithm retrieves appropriate case or form frames, puts them on a stack, and matches the next object in the program text to an object requirement in the topmost frame. Frames are often established absolutely, on the basis of significant programming language tokens (keywords) in the program text. In matching an object to a particular object requirement in a frame, the analysis algorithm considers the object's attributes, as well as its position, punctuation context, and preceding keyword, if any. Dissert. Abstr.

N84-14726 California Inst. of Tech., Pasadena.
SPACE-TIME ALGORITHMS: SEMANTICS AND METHODOLOGY Ph.D. Thesis
Marina Chien-mei Chen 1983 109 p
Avail: Univ. Microfilms Order No. DA8322668

A methodology for specifying concurrent systems is present. A model of computation for concurrent systems is presented first. The syntax and semantics of the language CRYSTAL are introduced. The specification of a system is called a space-time algorithm since space and time are explicit parameters in the description. Fixed-point semantics is used for abstracting the behavior of a system from its implementation. The consistency between an implementation and its description can therefore be ensured using this method. Formal semantics for an arbitrary transistor network is given. An interpreter for space-time algorithms a hierachical simulator--for VLSI systems is presented. The framework can be viewed as a concurrent programming notation when describing communicating processes circuits. Dissert. Abstr.

N84-14727# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NUMERICAL PROBLEMS FOR THE IMPLANTATION OF AN INPE ATMOSPHERIC CORRECTION SYSTEM FOR LANDSAT IMAGES [PROBLEMAS NUMERICOS PARA A IMPLANTACAO DO SISTEMA DE CORRECAO ATMOSFERICA DO INPE PARA IMAGENS LANDSAT]
Luiz Alberto Vieira Dias Jul. 1983 12 p refs Presented at the 1st Regional Applied and Computational Math. Meeting, Sao Jose dos Campos, Brazil, Feb. 1983 Submitted for publication
(INPE-2801-PRE/361) Avail: NTIS HC A02/MF A01

The numerical problems tackled when an atmospheric correction system was implemented are described. There are two types of problems, results accuracy, and excessive number of operations. The accuracy problem is solved by using the Burroughs B-6800 to compute the atmospheric transmittance. To reduce the number of operations, the use of precalculated tables is introduced, instead of actually doing the operations. Author

N84-14728# Materials Research Labs., Melbourne (Australia).
USERSIN: AN INTERACTIVE USER-INTERFACE FOR FORTRAN SIN
E. Northeast Mar. 1983 24 p refs
(MRL-R-877; AR-003-287) Avail: NTIS HC A02/MF A01

This report describes a program Usersin, written to give a quick and ready access to the necessary input data, and to provide a more convenient interactive mode for setting up a problem while the number-crunching remains a batch-oriented process. It is designed to be as machine independent as possible, to permit transition between computers as may be required. Author

N84-14729# European Space Agency, Paris (France).
SOFTWARE ENGINEERING
B. Battrick, comp. and E. J. Rolfe, comp. Aug. 1983 282 p refs Proc. of ESA/ESTEC Sem., Noordwijk, Netherlands, 11-14 Oct. 1983
(ESA-SP-199; ISSN-0379-6566) Avail: NTIS HC A13/MF A01

Software tools and workbenches; quality assurance; quality metrics; software project management; Ada programming language; and development of on board software were discussed. For individual titles, see N84-14730 through N84-14763.

N84-14730# European Space Agency, Paris (France).
INTEGRATED SOFTWARE ENGINEERING FACILITIES (ISEF)
G. Mostini (CERCI, Fontenay-sous-Bois, France) *In* ESA Software Eng. Aug. 1983 p 3-6 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The ISEF, a prototype of a programming environment to be used by ESA for developing and maintaining software products is introduced. The ISEF implements and validates software development methodologies. It is implemented on VAX under UNIX (trademark) operating system. It uses RAPPORT (trademark) a relational data base management system. It is a multiusers multiprojects software workshop. It applies throughout the whole life cycle of a software product from requirements definition to acceptance and maintainance phases. It helps in controlling the consistency of the product and managing its development. Author (ESA)

N84-14731# Institut de Genie Logiciel, Paris (France).
A SPECIFICATION ASSISTANCE SYSTEM (SAS)
M. Lissandre, P. Lagier, A. Skalli, and H. Massie *In* ESA Software Eng. Aug. 1983 p 7-17 refs (For primary document see N84-14729 05-61)

Avail: NTIS HC A13/MF A01

A portable tool which automates the Structured Analysis and Design Technique (SADT) graphical method is introduced. The Specification Assistance System (SAS) enables users to create and edit diagrams; to build sets of diagrams which, by the bringing of a reader/author cycle procedure into operation, assure quality; to maintain project files; to perform syntactic and semantic checks, and to carry out quality and productivity measurements. The SAS has five modules: text editor; graphics editor; SADT librarian; documentor; and SADT checker, written in PASCAL ISO under UNIX (trademark) and developed on the DOMAIN configuration of the IGL Apollo computer. Author (ESA)

N84-14732# European Space Agency, Paris (France).
THE INTEGRATED SOFTWARE ENGINEERING FACILITIES (ISEF) SOFTWARE CONFIGURATION MANAGEMENT SYSTEM
L. Diakite *In* ESA Software Eng. Aug. 1983 p 19-23 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A configuration management system consisting of three independent layers, integrated by a procedure, was developed. The on-line modification request control system uses a modification request database to provide all the information on a project. It helps follow up the evolution of a system and the different versions of its components, and can produce all types of reports. A version management system provides the archiving capabilities. It uses the same archive file to store a module and its updates, thus helping to control source and text files. The ISEF also supports formal requirements and design languages. Formal documents can be archived. A system generation tool produces executable images and prints documents, graphs, updates, etc, using Make a standard tool of Unix. The Make's work is driven by a file which shows how a program can be built from its components. The Make also accepts shell commands for printing. Author (ESA)

N84-14733# Politecnico di Milano (Italy). Dipt. di Elettronica.
CONSTRUCT: A TOOL FOR PROGRAMMING IN THE LARGE
C. Ghezzi, F. Tisato, L. Grossi, G. Senzani, and C. Serelli *In* ESA Software Eng. Aug. 1983 p 25-30 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The CONSTRUCT programming tool for building systems out of collections of modules, managing releases, versions, revisions, and maintaining consistent systems after modifications is described. The basic building blocks for systems structuring are called components. A component has a name, a type, and a list of views under which it may be seen. For example, a subsystem may be of type module-aggregate and the list of views under which it may be seen are: source language representation, object code representation, documentation, managerial information. Relationships among components are treated in a general way, and are implemented via invocations of specific view processors. Views and processors can be specialized according to particular requirements, retaining an overall control on the structure of a system, no matter which views are associated to each components and which processors are involved in the view generations. It can be easily rehosted on different machines. Author (ESA)

N84-14734# Olivetti (C.) and C., S.p.A., Turin (Italy).
AMIX: AN AUTOMATED SYSTEM FOR HANDLING ERROR NOTIFICATION DATA
G. Biamonti (ETNOTEAM, Milan), G. Faccia, B. Pepino, G. Picciau, and B. Valent (ETNOTEAM, Milan) *In* ESA Software Eng. Aug. 1983 p 31-35 ref (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

An automatic system for handling the notification of the errors found during the testing of a software product developed in an industrial environment is presented. It mantains an historical archive of all the problems met during the life cycle of the product, in order to be able to describe the quality trend. It is a component of the ATHENA quality control system and is written in C programming language, using UNIX/7 on a digital VAX/780. Author (ESA)

N84-14735# Technische Univ., Vienna (Austria). Inst. fuer Angewandte Informatik und Systemanalyse.
EDDA: A VERY HIGH LEVEL DATA FLOW SPECIFICATION LANGUAGE
H. Kerner, H. Motschnig, R. Pitrik, and W. Trattnig *In* ESA Software Eng. Aug. 1983 p 37-47 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A design language (EDDA) which has the graphical form and functional decomposition philosophy of the Structured Analysis and Design Technique (SADT) but adds all features necessary to promote it from the level of a pseudo code to a very high level language, that combines design and programming capabilities was developed. Changes to SADT are: a syntax and semantics for all operations; a clear data concept with operations for data manipulation; and additional operations for data, process, and resource abstraction. The resulting language is based on the application of functions which compute values and do not cause any side effects. Being a functional language, EDDA is employable for the design of distributed systems which involve parallel operations and their synchronization. In the process of continous refinement a functional program is created, which can be executed on a data flow computer or on an equivalent abstract machine simulated on a von Neumann computer. Author (ESA)

N84-14736# Electronique Serge Dassault, St. Cloud (France).
IDA: COMPUTER-AIDED TESTING OF REAL-TIME SOFTWARE
G. Lamarche and P. Taillibert *In* ESA Software Eng. Aug. 1983 p 49-57 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A static analysis technique for software validation (IDA) is presented. The technique features automation of test operations and ability to check nonregression of programs after each change or correction; real-time testing without disturbing program under test; checking of behavior such as exclusion and synchronization constraints of parallel processes; and testing at symbolic level without any reference to assembly code. The IDA test means are as far as possible independant of programming languages and of computers on which programs to be tested are run. Author (ESA)

N84-14737# Gesellschaft fuer Elektronische Informationsverabeitung m.b.H., Aachen (West Germany).
THE SOFTWARE ENGINEERING ENVIRONMENT PROJECT MODEL (PROMOD)
P. Hruschka *In* ESA Software Eng. Aug. 1983 p 59-63 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A software engineering environment (PROMOD) based on standard methods such as structured analysis and information hiding was produced to guide developers from problem analysis to acceptance test. It comprises interactive tools to give immediate feedback at every stage of the development of systems. Although oriented towards modern programming languages PROMOD is language independent. It is based on a life cycle model which establishes a relation between phases of development, procedures, and resulting documents, methods, and tools. It is available on PDP 11 under RSX, on VAX under VMS, and on a 16 bit microcomputer under MS-DOS. Author (ESA)

N84-14738# European Space Research and Technology Center, Noordwijk (Netherlands).
A USER'S VIEW OF THE STATISTIC ANALYSIS PACKAGE (SAP): A NEW SOFTWARE QUALITY ASSURANCE TOOL FOR FORTRAN PROGRAMS
P. J. Robinson *In* ESA Software Eng. Aug. 1983 p 67-71 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The Static Analysis Package (SAP) which provides static analysis and test coverage reports for FORTRAN 77 programs using the RAPPORT relational data base management system to hold the analysis data was assessed using a communications system simulation program, and a thermal analysis program. Experience show that SAP is an excellent tool for assessing FORTRAN program quality through static analysis of the code and calculation of the coverage of testing, although construction of a larger data base than that supplied is recommended. Author (ESA)

N84-14739# Institute for Coordination of Computing Techniques, Budapest (Hungary).
QUALIGRAPH: A SOFTWARE TOOL FOR QUALITY METRICS AND GRAPHIC DOCUMENTATION
J. Szentes *In* ESA Software Eng. Aug. 1983 p 73-81 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A software tool, QUALIGRAPH, providing a large set of quality metrics and unified graphic documentation of software products developed on different source languages is introduced. Possibilities for displaying control flow and calling structure as directed graph as well as for measuring their complexity are discussed. A special architecture of the system that provides graphics, tables, metrics in the same form, independently from the number and types of handled source languages, is detailed. The possibilities for applying this tool in earlier phases of software development process as well as for extending its services are exposed. Author (ESA)

N84-14740# Standard Telecommunication Labs. Ltd., Harlow (England).
REQUIREMENTS ON RELIABILITY MODELS, AND THEIR CONSEQUENCES
G. D. Frewin and P. G. Hamer *In* ESA Software Eng. Aug. 1983 p 83-91 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Traditional software (SW) reliability models are shown to be inadequate, or inappropriate, for many of the needs of those who design, develop, manage or procure software items. An informal model (consisting of qualitative descriptions, and general maxims, of error creation, fault insertion and fault activation) is suggested which, although diffuse and unquantified, is useful in assisting in SW engineering R and D, and in answering practical questions of SW production engineering. Author (ESA)

N84-14741# Electronique Serge Dassault, St. Cloud (France).
PRACTICAL IMPACT OF AN INTEGRATED WORKBENCH ON THE QUALITY ASSURANCE OF EMBEDDED SOFTWARE
G. Bracon *In* ESA Software Eng. Aug. 1983 p 95-103 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The life cycle concept of software quality assurance engineering; tools for quality assurance; an experimental integrated software engineering workbench; a requirement specification language for embedded computer software; a real time software test language; and quality and reliability measurement and evaluation are discussed. It is suggested that a software development system should feature two distinct layers: a general purpose set of basic mechanisms, such as the ones that can be found in a UNIX (trademark) environment, plus means allowing definition and support for overall project quality assurance; and one, or several, sets of tools suited for a given application area, each covering a specific function. These tools could use the general services of the former layer, and operate under control of the general quality assurance mechanisms. Author (ESA)

N84-14742# Marconi Space and Defence Systems Ltd., Portsmouth (England).
SOFTWARE CONFIGURATION MANAGEMENT
B. R. Young *In* ESA Software Eng. Aug. 1983 p 105-114 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The manner in which traditional configuration management practices are adopted to reach the individual components of a software system is outlined. The tools and procedures developed to extend practical control down to individual code modules are described. The concept of software packages; the codes of practice to cover module identification and media issue; and the software tools to enable direct package content control and printout of module status are considered. Author (ESA)

N84-14743# LABEN Space Instrumentation and Systems, Milan (Italy).
THE ROLE OF QUALITY ASSURANCE IN THE DEVELOPMENT OF SOFTWARE FOR SPACE APPLICATIONS
S. Ronchi *In* ESA Software Eng. Aug. 1983 p 115-124 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Documentation used to guide software quality assurance during development and verification stages, and to give directives for the production of a set of engineering and configuraton management documents is described. Requirement specifications, design, coding, testing, and acceptance of software products are discussed. Maintenance and auditing of space applications software are considered. Author (ESA)

N84-14744# GEC Turbine Generators, Leicester (England). Mechanical Engineering Lab.
PRACTICAL EXPERIENCE OF ENGINEERING SOFTWARE PRODUCTION TO A STRUCTURED PROGRAMMING STANDARD
J. N. Loughhead, G. A. Miles, and J. R. Turner *In* ESA Software Eng. Aug. 1983 p 125-136 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Experience gained during the development of the preprocessor for the ESATAN thermal analyzer is described. The software design and coding was undertaken by a strictly structured, top-down modular approach. Primary objectives of the development were production of an easily maintainable program and transportability of the software. The first of these was achieved by comprehensive documentation and code structuring, the second by coding the software in ANSI Standard FORTRAN 77. The preprocessor package consists of 300 modules, containing between 50 and 100 FORTRAN 77 statements each. The production of ESATAN demonstrates a viable software standard which fulfills its primary objectives. The penalty for these benefits lie largely in increased coding and integration time. Author (ESA)

N84-14745# Logica B.V., Rotterdan (Netherlands).
PROJECT MANAGEMENT AND QUALITY ASSURANCE IN A MULTIAPPLICATION ENVIRONMENT
J. Roberts *In* ESA Software Eng. Aug. 1983 p 137-143 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Problems associated with software project and quality management in an environment where a wide variety of technical activities and work practices are used are described. A solution which is partly organizational and partly procedural is presented. The organization described has normal responsability hierarchy with a strong orthogonal component. The procedures and standards are based around a number of fixed metastandards; the whole system allows great flexibility without becoming unmanageable. The central place of a work breakdown structure is discussed. Author (ESA)

N84-14746# European Space Operations Center, Darmstadt (West Germany).
SOFTWARE ENGINEERING TECHNIQUES EMPLOYED IN ON-SCHEDULE COMPLETION OF METEOSAT-2 SOFTWARE
A. Sesma *In* ESA Software Eng. Aug. 1983 p 145-152 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The applicability of software engineering principles and techniques to solve the problems of what to do first and how to do it is discussed. The problems experienced in implementation of a plan based on structured analysis and virtual machines are reviewed. These techniques were used in order to prepare a target-oriented plan with minimum schedule risk. A checklist of the planning tasks performed by the project manager is included. The checklist is written in pseudocode in the form of a manual procedure. The procedure is an attempt towards formal documentation of management experience. Author (ESA)

N84-14747# Commission of the European Communities, Brussels (Belgium). Task Force Information Technologies.

EUROPEAN COMMUNITY SUPPORT TO SOFTWARE ENGINEERING DEVELOPMENT THROUGH ADA ACTIVITIES AND ESPRIT

R. W. Meijer *In* ESA Software Eng. Aug. 1983 p 155-159 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Ada activities under the multiannual data processing program; and the software technology area of the ESPRIT program are described. The more general, long-term research orientation of the ESPRIT program is contrasted with the focused shorter term development approach in the Ada case. The further evolution of Ada is discussed, especially in relation to US developments and international standardization activities. European Commission activities with respect to dissemination of information on Ada, and the work of the Ada-Europe group are described. Author (ESA)

N84-14748# TECSI-Software, Paris (France).

COHERENT MANAGEMENT SUPPORT IN THE ADA ENVIRONMENT

K. Ripken *In* ESA Software Eng. Aug. 1983 p 161-166 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Methods and tools for supporting the development and maintenance of large scale software systems written in Ada were studied. The integration of the methods and tools for the whole range of software life cycle activities was emphasized. A coherent management support scheme was synthesized in an Ada programming support environment. The major coherency aspects of this scheme are described. Author (ESA)

N84-14749*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ADA AND THE NASA SOFTWARE ENVIRONMENT

E. W. Ng and R. Loesh *In* ESA Software Eng. Aug. 1983 p 167-168 (For primary document see N84-14729 05-61)
(Contract NAS7-100)
Avail: NTIS HC A13/MF A01

The NASA software, in broad categories, is described, and the software life cycle is characterized. Programming language policy and practices are reviewed. Applicability, benefits, and transition, as well as present and potential problems with Ada are examined. Author (ESA)

N84-14750# European Space Operations Center, Darmstadt (West Germany).

THE PET/MAESTRO: A USER'S VIEW

N. C. Head *In* ESA Software Eng. Aug. 1983 p 171-174 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A dedicated minicomputer system, designed to ease the tasks involved in the generation of a software system is described. It consists of a central processor unit with its associated peripherals and up to 24 display units. The displays are memory mapped video units, connected by coaxial cable to the processor unit. This allows extremely rapid updates of the display contents and helps to reduce response times of the system to levels far below those normally found. The system can be used for documentation, design, coding, maintenance and management. Diagram producing facilities are limited and it is difficult to transfer externally originated documents to the MAESTRO system. Experience in designing a small batch processor for ESA suggests that main advantages are in product quality and maintenance requirements, rather than in development cost reduction. Author (ESA)

N84-14751# Softlab G.m.b.H., Munich (West Germany).

THE PROJECT LIBRARY PLUS: A GENERAL OVERVIEW

F. Pfeifroth *In* ESA Software Eng. Aug. 1983 p 175-183 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

A project library (PLUS) used with the PET/MAESTRO software development system is described. The structure of the project library is defined by three dimensions: product structure; document structure; and versions. The PLUS provides project library services for administration of development material and for support standards, methods and so on; and project management services for task distribution and for the control of execution costs and dates. Author (ESA)

N84-14752# CAP Sogeti Logiciel, Toulouse (France). Space Branch.

SOFTWARE PRODUCTION IN A LARGE SPACE PROJECT: THE SPOT MISSION CENTER

Vu Tien Khang *In* ESA Software Eng. Aug. 1983 p 185-190 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The MULTIPRO software workbench used to manage the software production of a team of up to 20 engineers on the SPOT (French satellite) is described. The software runs on CDC Cybers or the SEMS Solaris 16. Software tools were developed for the firmware of the terminals, a librarian and a document generator. A detailed analysis language, not part of the workbench, is used on the Cyber as required by quality assurance. Author (ESA)

N84-14753# Ferranti Computer Systems Ltd., Cwmbran (England).

A HOST-TARGET PROGRAMMING SUPPORT ENVIRONMENT FOR THE PRODUCTION OF HIGH-QUALITY REAL-TIME SYSTEMS

E. J. Dowling and B. E. Avis *In* ESA Software Eng. Aug. 1983 p 191-198 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Hardware and software components of an environment used for the production of large, real time systems are discussed, together with the reasons behind the choices made. Many software tools come directly from the host system (a DEC VAX with VMS) but tools for software (configuration) management and software verification were developed. Ada and Ada program support environments are contrasted with features of the environment currently used. Author (ESA)

N84-14754# LABEN Space Instrumentation and Systems, Milan (Italy).

ONBOARD SOFTWARE TESTING AND QUALIFICATION

F. Longoni and R. Redaelli *In* ESA Software Eng. Aug. 1983 p 201-206 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Test requirements and objectives for on board software, test environments, and test methodologies are described, from static testing to integration and dynamic testing with real time simulation of the flight hardware, and final acceptance and qualification. The staff responsibilities during the different phases are outlined, together with the documentation produced. Retesting, in case of faults detected after the qualification, is covered. Author (ESA)

N84-14755# MATRA Service Aerodynamique, Toulouse (France).

SPOT ON-BOARD SOFTWARE TEST AND VALIDATION: METHODOLOGY AND TOOLS

J. P. Cau *In* ESA Software Eng. Aug. 1983 p 207-213 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The systems simulation technique used to test software developed for SPOT (French satellite) is described. The methodology is based on a formal structural comprehensive approach which is a trade off between the software state of the art and the constraints of satellite development. The main goal of the methodology is to ensure the exhaustivity of the tests. The satellite simulator allows a decoupling of software development and better confidence in the satellite development technical and planning aspects. The test methodology is valid, but a more automated test method is needed. Author (ESA)

N84-14756# National Aerospace Lab., Amsterdam (Netherlands).
RELIABILITY AND FLEXIBILITY OF THE INFRARED ASTRONOMICAL SATELLITE (IRAS) ON-BOARD SOFTWARE
G. J. Hameetman *In* ESA Software Eng. Aug. 1983 p 215-220 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The design criteria used during the development of the IRAS on board software to create a correct software system that combines reliability and flexibility are outlined. Results of this approach during the first five months of the mission are presented. The mission is very succesful, although part of the software was rewritten, to save the mission when one of the attitude sensors appeared to fail. Apart from this major modification, on board software changes were made due to changes of operational requirements. Author (ESA)

N84-14757# National Aerospace Lab., Amsterdam (Netherlands).
VERIFICATION AND VALIDATION OF INFRARED ASTRONOMICAL SATELLITE (IRAS) ON-BOARD SOFTWARE
R. J. Nicolai *In* ESA Software Eng. Aug. 1983 p 221-226 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

Systems simulation testing of IRAS on board software is described. The test configuration was largely determined by the attitude control system. Provision of representative inputs for the attitude control system tests required orbital simulation. The attitude control functions in ROM were exercised extensively in closed loop (satellite dynamics model in ground checkout computer), providing a flexible environment for combined black and white box testing. The less critical but more accurate RAM software was exercised in open loop (attitude sensor stimuli precomputed on a mainframe). The large amount of RAM software permitted only functional (black box) testing. The closed loop method is confirmed to be the most desirable. Author (ESA)

N84-14758# Hollandse Signaalapparaten N. V., Hengelo (Netherlands).
SOFTWARE FLEXIBILITY ENSURED SUCCESS OF DUTCH ASTRONOMICAL NETHERLANDS SATELLITE (ANS) AND INFRARED ASTRONOMICAL SATELLITE (IRAS) SATELLITES
J. A. vanStuyvenberg and C. W. G. vanderVoortMaarschalt *In* ESA Software Eng. Aug. 1983 p 227-231 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The ANS and IRAS software is described, and it is shown that the reprogramming feature of the software allowed both missions to cope in a very effective way with unexpected events endangering these missions. An on board computer (OBC) is the overall controller of the spacecraft. The OBC is also very useful in the integration and test phase. Many programs were loaded for individual subsystems and for the integrated satellites. Software reprogrammability enabled ANS to achieve mission objectives despite a launch error which put the satellite into an elliptical orbit with 1600 km apogee, instead of a 500 km circular twilight orbit. The IRAS OBC had to be reprogrammed because the satellite was in a back up mode which interrupted scientific operations each time it appeared over a ground station. Author (ESA)

N84-14759# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SOFTWARE QUALITY ASSURANCE SPACELAB EXPERIENCE AND FUTURE TRENDS
R. Davenport *In* ESA Software Eng. Aug. 1983 p 235-241 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The quality assurance plan used when developing the command and data management software subsystem to support the functions of Spacelab in flight; automatic test equipment software subsystem to support the functions needed for ground checkout of Spacelab; and support software subsystem to generate and maintain a common data base and to provide a generation mechanism for software for the other two subsystems, is outlined. The software problem reports, unit development folders, verification control document, test data folder, acceptance data package, and certificate of acceptance are described. Trends in developing automated software quality assurance tools are reviewed. Author (ESA)

N84-14760# European Space Agency, Paris (France).
ANSI ADA AND THE UK M-CHAPSE
J. G. P. Barnes *In* ESA Software Eng. Aug. 1983 p 243-250 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The major changes to Ada resulting from the ANSI standardization process are summarized. The M-CHAPSE project to provide the foundation for a professional programming support environment for Ada and CHILL is described. The M-CHAPSE objectives are: to provide host-target development systems with source debugging on the host; to provide consistent and convenient user friendly interfaces; to provide an open ended environment which accommodates further tools; to provide a foundation which supports all aspects of the entire system life cycle; to provide a portable system which can be rehosted and retargetted at reasonable cost; and to provide a secure and reasonably efficient system. Author (ESA)

N84-14761# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
MODERN SOFTWARE DEVELOPMENT TOOLS IN SPACE PROJECTS ON THE EXAMPLE OF A SPACELAB EXPERIMENT
O. Neff, R. Schmidt, and H.-J. Schneider *In* ESA Software Eng. Aug. 1983 p 257-259 (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The life cycle of the software for a Spacelab experiment is outlined. Typical software requirements for spacecraft experiments, and software development tools used in this project are presented. The program design language; the real time language PEARL for programming; and a powerful debugging system, which can also be used for test and operation of the complete experiment are described. An implementation of the compiler and real time operating system, resulting in very efficient object code is demonstrated. Author (ESA)

N84-14762# European Space Operations Center, Darmstadt (West Germany).
COMPARISON OF THE PORTABLE PROGRAM ECS PACKAGE FOR SYNCHRONOUS ORBIT CONTROL (PEPSOC) AND THE ESOC MULTI-SATELLITE SUPPORT SYSTEM (MSSS) CONTROL SOFTWARE
S. Pallaschke *In* ESA Software Eng. Aug. 1983 p 261-267 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The differences in goestationary orbit control software between the MSSS package (used in house where the staff familiar with the software modules can assist the operations team and can perform the necessary maintenance) and the PEPSOC version (run at a remote ground station by satellite control personnel) are outlined. The MSSS package was developed simultaneously with the design of the satellite and therefore changes in satellite hardware influenced the software requirements. The PEPSOC was developed according to fixed requirements, and MSSS was used as prototype. The constraints put on software development aspects, such as design, portability, resulting from fluid requirements (MSSS case) and from fixed software requirements (PEPSOC situation) are discussed. Author (ESA)

N84-14763# National Aerospace Lab., Amsterdam (Netherlands).
INFRARED ASTRONOMICAL SATELLITE (IRAS) END-TO-END DATA SYSTEM
R. C. vanHoltz *In* ESA Software Eng. Aug. 1983 p 269-275 refs (For primary document see N84-14729 05-61)
Avail: NTIS HC A13/MF A01

The end-to-end data system approach used during the design and development phases of the IRAS project is assessed in the light of 6 months operational experience. Areas where further application of the principle would be beneficial are indicated. Experience shows that the approach improves cost effectiveness of the design, completeness, reliability and operational sturdiness/flexibility, and provides project managers with milestones against which progress can be measured. A seperately budgeted integration and test facility to develop test tools (or integrate them from available tools) with which the data system can be checked out independently on system level is advocated. Where a large amount of interaction exists with a user community during the operations, interface control documents should cover human interfaces as well. It is useful first to specify the user interfaces down to the level of questions and answers, and verify that these suit their needs before software development start. Author (ESA)

N84-14764# Maryland Univ., College Park. Dept. of Computer Science.
COMBINING TESTING WITH FORMAL SPECIFICATIONS: A CASE STUDY
Paul R. McMullin and John D. Gannon May 1983 9 p Repr. from IEEE Trans. on Software Eng., v. SE-9, no. 3, May 1983 p 328-335
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A134110; AFOSR-83-0779TR) Avail: NTIS HC A02/MF A01 CSCL 05/9

Specification, implementation, and validation of a record oriented text editor is discussed. Algebraic axioms serve as the specification notation. The implementation was tested with a compiler based system that uses the axioms to test implementations with a finite collection of test cases. Formal specifications were sometimes difficult to produce, but helped reveal errors during unit testing. Thorough exercising of the implementations by the specifications resulted in few errors persisting until integration. Author

N84-14765# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
RESEARCH IN KNOWLEDGE REPRESENTATION FOR NATURAL LANGUAGE UNDERSTANDING Annual Report, 1 Sep. 1982 - 31 Aug. 1983
C. Sidner, M. Bates, R. Bobrow, B. Goodman, A. R. Haas, R. Ingria, D. J. Israel, D. McAllester, M. Moser, and J. Schmolze Oct. 1983 244 p
(Contract N00014-77-C-0378; ARPA Order 3414)
(AD-A134102; BBN-5421) Avail: NTIS HC A11/MF A01 CSCL 05/7

BBN's ARPA project in Knowledge Representation for Natural Language Understanding is aimed at developing techniques for rendering computer-based assistance to a decision maker who is attempting to understand and react to a complex, evolving system or situation. The decision maker's access to the situation is mediated by an intelligent graphics display system, which is controlled largely through natural language input. The work during this past year falls into two main categories: fundamental problems in knowledge representation and reasoning, and fluent natural language understanding. In this report, we first give a brief overview and summary of the activities of the project during the year. This is followed by a series of detailed presentations of research in particular areas. In addition, we document publications and presentations by members of the research group. Author (GRA)

N84-14766# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT: KAPSE (KERNEL ADA PROGRAMMING SUPPORT ENVIRONMENT)/DATABASE, TYPE b5, B5-AIE(1).KAPSE(1)
12 Nov. 1982 182 p
(Contract F30602-80-C-0291)
(AD-A134092; IR-678-2) Avail: NTIS HC A09/MF A01 CSCL 09/2

This specification establishes the requirements for performance, design, test, and qualification of a set of computer program modules identified as the Kernel Ada Programming Support Environment (KAPSE) of the Ada Integrated Environment. The KAPSE provides several facilities to the Ada Programming Support Environment, which can be grouped into the following five Computer Program Configuration Items: (1) SIMPCOMP - Database Operations on Simple and Composite Objects; (2) ACCECAT - Access Control and Categorization of Database Objects, and the Manipulation of User-Defined Attributes; (3) MULTPROG - Invocation of and Communication Between Multiple Ada Programs, plus Multi-User and Multi-KAPSE Support and Synchronization; (4) HISTARCH - Configuration and System Management, with History, Archiving, Backup, and Recovery; and (5) RTS - Run-Time Support for the Execution of Ada Programs, including Language-Defined Input/Output Packages. This specification identifies the functional capabilities of the various KAPSE computer program components and describes the KAPSE/tool interfaces as well as the KAPSE/Host computer interfaces. GRA

N84-14767# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT: VIRTUAL MEMORY METHODOLOGY, B5-AIE(1).VMM(2)
8 Oct. 1982 48 p
(Contract F30602-80-C-0291)
(AD-A134091; IR-MA-142-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This specification defines the requirements for the Virtual Memory Methodology subsystem. VMM is a component of the Minimal Ada Programming Support Environment (MAPSE) of the Ada Integrated Environment, providing MAPSE tools with facilities required to construct and manipulate data in a consistent, reliable, and portable form. The VMM subsystem is a tool for creating and manipulating abstract data structures (attributed directed graphs, in particular) in a machine-independent manner. A virtual memory paging scheme makes the size of any data structure independent of the memory constraints of any particular hardware configuration. The Virtual Record Notation IO package (VRN IO) supports input and output of data in an external, human-readable format, translating data into the terms of the particular implementation thereby satisfying portability requirements. A permanent, directly accessible representation of a VMM data structure can be created in the KAPSE (Kernel Ada Programming Support Environment) database and accessed by any MAPSE tool or user program, providing a standard data interface for inter-program communication. GRA

N84-14768# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
COMPUTER-AIDED STRUCTURAL ENGINEERING (CASE) PROJECT. USER'S GUIDE: COMPUTER PROGRAM TO CALCULATE SHEAR, MOMENT AND THRUST (CSMT) FROM STRESS RESULTS OF A TWO-DIMENSIONAL FINITE ELEMENT ANALYSIS Final Report
Fred T. Tracy, Robert L. Hall, and Kenneth W. Trahan Jul. 1983 59 p
(AD-A134089; WES-Instruction-K-83-5) Avail: NTIS HC A04/MF A01 CSCL 09/2

The program CSMT calculates shear, moment, and thrust for sections of a structure specified by the user, from stress results of a two-dimensional finite element (FE) analysis. The bulk of the input is for geometry definition (node and element data) and the stress results from a FE analysis. The node and element data are read free-field from one data file, and the stresses are read from another file. The remaining data are interactive commands to specify section information and to obtain plots of grid, sections, and results (shear, moment, and thrust). Author (GRA)

N84-14769# Intermetrics, Inc., Cambridge, Mass.
SYSTEM SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT TYPE A AIE(1)
12 Nov. 1982 51 p
(Contract F30602-80-C-0291)
(AD-A134080; IR-676-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This specification establishes the performance, design, development and test requirements for the Ada Integrated Environment

(AIE), an integrated set of software tools designed to support the development and maintenance of software written in the Ada Programming Language. GRA

N84-14770# Computer Sciences Corp., San Diego, Calif.
NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION PROBABILITIES FROM EMPIRICAL DATA Final Report, 1982
J. L. Hofmockel Sep. 1982 477 p
(Contract N00123-79-D-0272)
(AD-A134078; NOSC/CR-153) Avail: NTIS HC A21/MF A01 CSCL 09/2

The Naval Ocean Systems Center (NOSC) was tasked by NAVELEX 612 under the subject of empirical detection analysis to develop techniques for estimating detection probabilities. Computer Sciences Corporation was subsequently tasked by NOSC to develop data bases and nonlinear regression analysis techniques to describe the acoustic detection process as a function of signal excess. Statistical techniques, primitive empirical data bases and ancillary computer programs used to relate the empirical data to models were developed previously at NOSC during other analyses of acoustic detection probabilities. These resources and the UCLA Department of Biomathematics Statistical Software were made available as a baseline for the nonlinear regression analysis methodology used in this investigation. GRA

N84-14771# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT: MAPSE DEBUGGING FACILITIES, B5-AIE(1).DBUG(1)
5 Jan. 1983 48 p
(Contract F30602-80-C-0291)
(AD-A134070; IR-682-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document specifies the requirements for the performance and verification of the AIE (Ada Integrated Environment) debugging facilities. It includes descriptions of: (1) the user debug command language; (2) the DEBUGGER (DBUG) subsystem that provides these facilities; and (3) the interface between DBUG and other AIE components, through which debugging tasks are performed. Identification: DBUG is classified within the AIE configuration both as a subsystem and as a CPCI (Computer Program Configuration Item). It consists of the following CPC's (Computer Program Components): Command Processor; Execution Control Procedures; Breakpoint Command Procedures; Utility Procedures; Information Command Procedures; Program Library Access Procedures; and DBUG Database. DBUG provides facilities for dynamic, symbolic debugging of user programs within the AIE. A program is run under DBUG control with user-specified points at which execution is suspended (breakpoints). At such points, the user can examine and modify program variables, trace and modify the flow of execution, and establish additional breakpoints. The user specifies debugging actions via a command language that permits ordinary Ada representations for most program elements. Commands can be issued interactively or stored as scripts for batch mode processing. GRA

N84-14772# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATICN FOR ADA INTEGRATED ENVIRONMENT. MAPSE COMMAND PROCESSOR B5-AIE(1).MCP (1)
1 Dec. 1982 1 p
(Contract F30602-80-C-0291)
(AD-A134033; IR-679-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

This specification describes the MAPSE(Minimal Ada Programming Support Environment) Command Language (MCL) with which a user selects AIE (Ada Integrated Environment) facilities, and establishes the requirements for performance, design, test and qualification of the MAPSE Command Processor, a computer program that interprets and acts upon MCL commands. This specification also identifies interfaces with the KAPSE (Kernel Ada Programming Support Environment) and with other MAPSE tools that, together, provide the full range of capabilities available to the AIE user. MCP is classified within the AIE configuration both as a subsystem and as a Computer Program Configuration Item. GRA

N84-14773# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT. ADA COMPILER PHASES B5-AIE (1). COMP (1)
5 Nov. 1982 112 p
(Contract F30602-80-C-0291)
(AD-A134032; IR-677-2) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document specifies the requirements for the performance and verification of the Ada compilers for the IBM (VM/370) and Perkin-Elmer (PE) 8/32 (OS/32) systems. Each compiler provides the user with the ability to translate an Ada compilation and obtain a program listing and linkable machine code for the respective target machine; listing, optimization, and debugging control are selectable by the user. Because of the compiler structure and the similarity of the target machines, the two compilers are nearly identical. As a result, this document presents the design as though there were a single Ada compiler; where target-machine dependencies make the compilers different, this is pointed out in the discussion. GRA

N84-14774# Intermetrics, Inc., Cambridge, Mass.
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR ADA INTEGRATED ENVIRONMENT: PROGRAM INTEGRATION FACILITIES, TYPE b5, B5-AIE (1). PIF (1)
22 Mar. 1983 78 p
(Contract F30602-80-C-0291)
(AD-A134003; IR-681-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

This document establishes the performance, design, test, and qualification requirements for the Program Integration Facilities for the Ada Integrated Environment. These facilities include the Program Library Interface Packages, the Program Builder and the Program Library Support Tools. This document also includes requirements for the design of the Ada program library, the environment within which program integration occurs. GRA

N84-14775# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
A 2-TIERED APPROACH TO SPECIFYING PROGRAMS Ph.D. Thesis
Jeanette Marie Wing Jun. 1983 167 p
(Contract N00014-83-K-0125; Grant NSF MCS-81-19846)
(AD-A133949; MIT/LCS/TR-299) Avail: NTIS HC A08/MF A01 CSCL 09/2

Current research in specifications is beginning to emphasize the practical use of formal specifications in program design. This thesis presents a specification approach, a specification language that supports that approach, some ways to evaluate specifications written in that language. The two-tiered approach separates the specification of underlying abstractions from the specification of state transformations. In this approach, state transformations and target programming language dependencies are isolated into an interface language component. All interface specifications are built upon shared language specifications that describe the underlying abstractions. This thesis presents an interface specification language for the CLU programming language and presumes the use of the Larch shared language. This thesis also suggests a number of kinds of analyses that one might want to perform on two-tiered specifications. These are related to the consistency, completeness, and strength of specifications, and are all presented in terms of the theories associated with specifications. GRA

N84-14776# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
EFFICIENT DEMAND-DRIVEN EVALUATION (2) Interim Research Report
Keshav Pingali and Arvind Sep. 1983 56 p

(Contract N00014-75-C-0661)
(AD-A133879; MIT/LCS/TM-243) Avail: NTIS HC A04/MF A01 CSCL 09/2

In Part I of this paper, we presented a scheme whereby a compiler could propagate demands through programs in a powerful stream language L. A data-driven evaluation of the transformed program performed exactly the same computation as a demand-driven evaluation of the original program. In this paper, we explore a different transformation which trades the complexity of demand propagation for a bounded amount of extra computation on some data lines. We showed that a lazy progam can be associated with any LD program and explored the concept of safe LD programs which were LD programs that performed a bounded amount of extra computation over that performed by their corresponding lazy programs. Since the set of safe programs is not closed under composition, we defined strongly-safe programs as being that subset of safe programs which is closed under composition. A class of strongly-safe programs is the set of all LD programs that are safe and input-output equivalent to their corresponding lazy programs. GRA

N84-14777# Aeronautical Research Labs., Melbourne (Australia).
SPECAN (SPECTRAL ANALYSIS): A PROGRAM IN ACSL FOR STOCHASTIC TIME SERIES ANALYSIS
P. H. Hall Jul. 1983 42 p
(AD-A133719; ARL-AERO-TM-352) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document describes a computer program which uses Advanced Continuous Simulation Language (ACSL) for stochastic time series analysis on a DEC system-10 computer. The use of ACSL has considerably reduced programming effort and has provided the user flexibility in the selection of various output options with different modes of presentation. An example of a spectral analysis of a discrete time series using SPECAN is also presented in this Memorandum. GRA

N84-14778# Naval Postgraduate School, Monterey, Calif.
DESIGN AND IMPLEMENTATION OF SOFTWARE PROTOCOL IN VAX/VMS USING ETHERNET LOCAL AREA NETWORK M.S. Thesis
Thawip P. Netniyom Jun. 1983 119 p
(AD-A133699) Avail: NTIS HC A06/MF A01 CSCL 17/2

This thesis presents the design and implementation of a software protocol for the VAX-11/780, under the VMS operating system, to allow message and file transfer to and from the INTELIEC MDS system, under CP/M-80 operating system, via the Ethernet local area network. The design of this software protocol is based on the protocol hierarchies where the network is organized as a series of layers or levels, each one build upon its predecessor. The purpose of each layer is to offer certain services to the higher layers, shielding those layers from the details of how the offered services are actually implemented. With this design concept, the desired software protocol will be transportable in the sense that it can be used by different kinds of computer systems with minimal modifications. The Ethernet local area network is also designed in this same highly structured way. Author (GRA)

N84-14779# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Sciences.
RELATIONAL PROGRAMMING
Bruce J. MacLennan Sep. 1983 79 p
(RR00001100)
(AD-A133643; NPS52-83-012) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report describes relational programming, a style of programming in which entire relations are manipulated as data, and in which programs are represented as relations. The use of relational operators on both data and programs is illustrated, and implementation issues are discussed. Author (GRA)

N84-14780# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.
GENERATING DATA FLOW PROGRAMS FROM NONPROCEDURAL SPECIFICATIONS Ph.D. Thesis
Maya Balkrishna Gokhale Mar. 1983 218 p
(Contract N00014-76-C-0416)
(AD-A132609) Avail: NTIS HC A10/MF A01 CSCL 09/2

Data flow is a mode of parallel computation in which parallelism in a program can be exploited at the fine grained as well as macro level. A data flow computer executes a data dependency graph rather than the program counter controlled sequence of instructions executed by conventional machines. Nonprocedural languages appear to be especially appropriate high level languages for data flow computers. Nonprocedural languages have only two statement forms: data description and assertion. The assertions enumerate the relationships among the data. A data dependency graph is also a suitable representation for a nonprocedural language program (or specification). This research is concerned with translating the dependency graph form of a specification to a program graph for a data flow machine. Specifications in the MODEL language are translated into an intermediate form, the data flow template. The template is a language-independent representation of the specification. The template is then translated into a data flow language (Manchester Dataflow) for the Manchester University machine. Author (GRA)

N84-14781# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
LEARNING TO PROGRAM IN LISP Final Technical Report
John R. Anderson, Robert Farrell, and Ron Sauers 1 Sep. 1983 75 p
(Contract N00014-81-C-0335; NR Proj. 157-465)
(AD-A132611; TR-83-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 09/2

We have gathered protocols of subjects in their first 30 hours of learning LISP. The processes by which subjects write LISP functions to meet problem specifications has been modeled in a simulation program called GRAPES (Goal Restricted Production System). The GRAPES system embodies the goal-restricted architecture for production systems as specified in the ACT theory. We compare our simulation to human protocols on a number of problems. GRAPES simulates the top-down, depth-first flow of control exhibited by subjects and produces code very similar to subject code. Special attention is given to modeling student solutions by analogy, how students learn from doing, and how failures of working memory affect the course of problem solving. Of major concern is the process by which GRAPES compiles operators in solving one problem to facilitate the solution of later problems. Author (GRA)

N84-14782# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.
THE SOFTWARE ENGINEERING PROTOTYPE M.S. Thesis
Michael R. Kirchner Jun. 1983 101 p
(AD-A132612) Avail: NTIS HC A06/MF A01 CSCL 09/2

Experience has shown that the traditional method of software development often has poor results. Recently, a new approach to software development, the prototype approach, has been proposed. This thesis presents an integrated view of general design theories and relates that view to software design and development. The current thought on prototypes is described and the basic requirements for a software engineering environment are presented. Software prototypes are shown to support the integrated view of design. Four case studies of using prototypes are presented and recommendations for further study are made. Author (GRA)

N84-14783# Stanford Univ., Calif. Center for Reliable Computing.
A STUDY OF SOFTWARE FAILURES AND RECOVERY IN THE MVS OPERATING SYSTEM Interim Technical Report
Paola Velardi and Ravishankar K. Iyer Jul. 1983 51 p
(Contract DAAG29-82-K-0105)
(AD-A132681; CRC-TR-83-7; ARO-18690.6-EL) Avail: NTIS HC A04/MF A01 CSCL 09/2

This paper describes an analysis of system-detected software errors on the MVS operating system at the Center for Information

Technology, at Standford University. The analysis determines the most common error categories and relates them to the program in execution at the time of the error. The severity of the error is measured by evaluating the criticality of the program for continued system operation. The system recovery and error correction features are then analyzed and an estimate of the system fault tolerance to errors of different levels of severity is made. GRA

N84-14784# Air Force Academy, Colo.

REPORT OF THE FACULTY WORKING GROUP ON COMPUTERS

1 Jun. 1983 71 p
(AD-A132706; USAFA-TR-83-14) Avail: NTIS HC A04/MF A01 CSCL 05/1

Many academic institutions are considering or already implementing large scale distributed computing systems to include student owned microcomputers. The potential benefit of these computers to the education process is enormous, but so are the risks. A real danger is the expensive hardware will be underutilized for lack of applications. Faculty involvement with the new computing resources is the key to effective utilization. Committees within the U.S. Air Force Academy are now considering various distributed computing options. A survey of the Academy faculty was conducted to assess their readiness and willingness to use the proposed systems. The survey summarizes the available faculty resources to support distributed computer applications and their opinions concerning implementation plans. Author (GRA)

N84-14785# Naval Research Lab., Washington, D. C.

INTERFACE SPECIFICATIONS FOR THE SCR (A-7E) APPLICATION DATA TYPES MODULE Interim Report

P. C. Clements, S. R. Faulk, and D. L. Parnas 23 Aug. 1983 33 p
(F21242)
(AD-A132717; NRL-8734) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes the programmer interface to a set of avionics-oriented abstract data types implemented in software. The Application Data Types module is part of NRL's Software Cost Reduction (SCR) project, to demonstrate the feasibility of applying advanced software engineering techniques to complex real-time systems to simplify maintenance. The Application Data Types module allows operations on data independent of the representation. In the case of numeric abstract types, which represent physical quantities such as speed or distance, arithmetic operations may be performed independent of the units of physical measure. This allows the rest of the application software to remain unchanged even when representation decisions change about these data. These report contains the abstract interface specifications for all the facilities provided to users by this module. It serves as development and maintenance documentation for the SCR software design, and it is also intended as a model for other people interested in applying the abstract interface approach on other software projects. GRA

N84-14786# Texas A&M Univ., College Station. Dept. of Statistics.

A USER'S GUIDE TO BISAM: THE BIVARIATE DATA MODELING PROGRAM

Terry J. Woodfield Aug. 1983 68 p
(Contract DAAG29-83-K-0051)
(AD-A132722; TR-A-24; ARO-20140.4-MA) Avail: NTIS HC A04/MF A01 CSCL 09/2

The BISAM (Bivariate SAMple) program is a FORTRAN program composed of a main program and 37 subprograms. Several of the subprograms come from ONESAM and the TIMESBOARD Time Series Subroutine Library. The main feature of BISAM is the ability to provide estimates of the bivariate density-quantile function of a set of bivariate data. A univariate analysis is also provided similar to that of ONESAM but with considerably less output. The univariate analysis is not intended to replace a ONESAM analysis if such a detailed analysis is required. The bivariate analysis includes display of various nonparametric measures of association along with some entropy measures that provide diagnostics for model selection and testing for independence. Graphical display of the estimated bivariate dependence density and density-quantile is the responsibility of the user, but a two step procedure utilizing the GCONTOUR and G3D procedures of SAS/GRAPH will be suggested in a later section. Different installations will have different software to provide three dimensional plots, hence the plotting option has been excluded from BISAM. One of the advantages of the modeling approach adopted by the BISAM program is the ability to obtain quickly and efficiently a set of function values for a dense grid of bivariate points promoting the examination of three dimensional representation of functions of interest. Author (GRA)

N84-14787# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.

AN EMPIRICALLY DEVELOPED FOURIER SERIES MODEL FOR DESCRIBING SOFTWARE FAILURES

Larry H. Crow and Nozer D. Singpurwalla Jul. 1983 35 p
(AD-A132739; AMSAA-TR-373) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper, the authors draw attention to the fact the times between failures of a large software system, between any two program fixes, need not be independently and exponentially distributed, as has been often assumed in the past. It is argued that, in several instances, such times between failures occur in clusters, often systematically, and present some data to substantiate this claim. Then proposed is an empirically developed Fourier series model, which can provide an adequate description of our data, and which under certain circumstances can be used to predict future failures. Much of the analysis here is informal, and the key tool used to develop our approach is a spectrogram of the data. Author (GRA)

N84-14788# Colorado State Univ., Fort Collins. Dept. of Computer Science.

FSCAN-83 REPORT AND USER'S MANUAL Interim Technical Report

Geoffrey M. Clemm Jan. 1983 29 p
(Grant DAAG29-78-G-0046)
(AD-A132740; CU-CS-248-83; ARO-15074.14-MA) Avail: NTIS HC A03/MF A01 CSCL 09/2

FSCAN is a language for specifying the lexical analysis of programs written in any current programming language, including FORTRAN. This report describes the FSCAN language, a compiler for the language, and an interpreter for the resulting object code. The interpreted object code forms an efficient lexical analyzer that takes as input a stream of characters and produces as output a stream of tokens (lexical units). The compiler and interpreter are designed for portability. Both are written in ANSI FORTRAN supplemented by a small number of short machine dependent subroutines. Included is a FSCAN program describing a FORTRAN-77 lexical analyzer. Author (GRA)

N84-14789# Colorado Univ., Boulder. Dept. of Computer Science.

TREGRM-83 REPORT AND USER'S MANUAL Interim Technical Report

Geoffrey M. Clemm Jan. 1983 37 p
(Grant DAAG29-78-G-0046)
(AD-A132874; CU-CS-249-83; ARO-15074.15-MA) Avail: NTIS HC A03/MF A01 CSCL 09/2

The first phase of the analysis of a computer program is lexical analysis, where the source text is broken up into the words or tokens, of the programming language. The second phase is syntactic analysis of parsing, where structure of the program is determined. The result of parsing is often a sequence of calls to a semantic routine with a reduction number or action number as the argument. To provide a more structured interface between the syntactic analysis and semantic analysis of a program, a parse tree can be created, where the parse tree is a flattened (simplified) version of the derivation tree for that program. To support the production of parse tree for generators, the TREGRM System was developed. TREGRM is a language for specifying the creation of parse trees for any current programming language, including FORTRAN. This report describes the TREGRM language, a compiler for the language, and an interpreter for the resulting object code. The interpreted object code, in conjunction with a lexical analyzer, forms a syntactic analyzer that takes as input a stream of characters and produces as output a parse tree. The compiler and interpreter are designed for portability. Both are written in ANSI FORTRAN supplemented by a small number of short machine dependent subroutines. Included is a TREGRM program describing the syntax of FORTRAN-77. GRA

N84-14790# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Sciences.
A COMPUTER SCIENCE VERSION OF GOEDEL'S THEOREM
Bruce J. MacLennan Aug. 1983 19 p
(RR0000110)
(AD-A132903; NPS52-83-010) Avail: NTIS HC A02/MF A01
CSCL 09/2

The author presents a simplified proof of Godel's theorem by appealing to well-known programming concepts. The significance of Goedel's result to computer science, mathematics and logic is discussed. Author (GRA)

N84-14791# Computer System Associates, San Diego, Calif.
INVESTIGATION OF INTRINSICALLY ERROR-FREE PROGRAMS Final Report, 20 Apr. 1981 - 19 Jun. 1983
G. Victor Wintriss, Jeannie Wolf, Michael Andrews, Nicholas Panos, and Andrew Ash 27 Jul. 1983 49 p
(Contract DAAG29-81-C-0021)
(AD-A132934; ARO-18465.1-EL-S) Avail: NTIS HC A03/MF A01
CSCL 09/2

The report analyzes the application of machine design techniques to software development. The techniques of finite state machine design are extended to software design. The requirements for an automated programming system are developed and a prototype system is described. Author (GRA)

N84-14792# Performance Measurement Associates, Inc., Vienna, Va.
FACTORS AFFECTING SPECIFICATIONS FOR COMPUTER SOFTWARE PROGRAMS Annual Summary Report, 1 Jul. 1982 - 30 Jun. 1983
Edward M. Connelly Jul. 1983 30 p
(Contract N00014-82-C-0499; RR04209)
(AD-A133070; PMA-83-821) Avail: NTIS HC A03/MF A01 CSCL 09/2

The vulnerability of the software process development to errors or omissions in the requirements specification is well known. The goal of this program is to develop user aids that will help a neophyte user to work with an experienced software analyst in developing requirements specifications. The initial experiment, completed this year, is an investigation of the utility of cost aids as a function of task complexity. The neophyte user developed various designs and requested cost information for those designs which were presented in various forms. The aids permitted the user to recall detailed information on previous designs, as well as, a automatic analysis of previous designs to reveal the most cost effective design and suggest new designs. Author (GRA)

N84-14793# Information Spectrum, Inc., Arlington, Va.
ENHANCEMENT AND VERIFICATION OF THE NAVY CASEE MODEL (CALENDAR YEAR 1982 TASK) Final Report, Dec. 1981 - Dec. 1982
15 Dec. 1982 148 p
(Contract N60921-82-C-0010)
(AD-A133077; ISI-V-1768-02) Avail: NTIS HC A07/MF A01 CSCL 09/2

In order to respond to evolving aircraft maintenance/material support process and planning procedures and reporting systems, the Navy CASEE (Comprehensive Aircraft Support Effectiveness and Evaluation) Model requires periodic updating and restructuring. The CASEE enhancements described in this report resulted from basic needs within the CASEE user community to have CASEE reflect the changing criteria that are instrumental in evaluating fleet operating and maintenance policies and options. Specific enhancements were selected and implemented based on their projected utility in known and anticipated CASEE applications. Each was defined by a problem statement and a corrective action description. Program listings incorporating the enhancements were subsequently generated. A new CASEE version, Version 5, was developed as an initial attempt to reflect SCIR (Subsystem Capability Impact Reporting) system reporting criteria. Optional logic was developed to allow CASEE to more accurately simulate Navy NonCyclic flight operations that are more typical of shore-based operations. To provided even more visibility into the Intermediate Maintenance Activity (IMA), which was enhanced in Version 3, changes were made to improve the ability of CASEE to simulate support equipment availability at the IMA. GRA

N84-14794# Los Alamos Scientific Lab., N. Mex. Computer Research and Applications Group.
CRAY-1 INSTRUCTION ANALYSIS: A COMPARISON OF TWO METHODS
Joanne L. Martin and Tony Warnock (Cray Research, Inc.) 1983 24 p refs Presented at the 14th Computer Meas. Group Conf., Washington, 6-9 Dec. 1983
(Contract W-7405-eng-36)
(DE83-012778; LA-UR-83-1500; CONF-831208-1) Avail: NTIS HC A02/MF A01

In an effort to obtain data for workload characterization and performance evaluation studies, statistics were gathered on the frequencies of individual instructions in codes executing on the Cray-1. Two methods were used for the collection of data: direct dynamic counting of executing instructions and sampling of instructions at regular intervals during execution of the code. The implementation of both methods was described. The results obtained were compared. Because the Cray-1 is a vector processor, the sampling technique produces skewed results that misrepresent the workload being examined. Therefore, although it is easier to implement, sampling produces inaccurate results and is an invalid approach to performance evaluation studies on a vector computer. The counting of instructions provides a valuable profile of instruction frequencies and is a stable basis on which to build performance estimations. DOE

N84-14795# Los Alamos Scientific Lab., N. Mex. Computer User Services Group.
MODELING THE USER IN INTELLIGENT USER INTERFACES
Mary L. Stoddard and Robert J. Douglass 1983 9 p refs Presented at the CHI Conf., Cambridge, Mass. 12-15 Dec. 1983
(Contract W-7405-eng-36)
(DE84-012664; LA-UR-83-1392; CONF-831202-2) Avail: NTIS HC A02/MF A01

A methodology for explicitly defining a model of a program's users and for evaluating the effectiveness of the user interface is presented. The development of an explicit user model will reduce user costs by both reducing the cost of software development and increasing user productivity. The components of the methodology are described, and an example of using the methodology in the development of an expert consultant system is given. The methodology is useful in preliminary design and testing of such interactive software as electronic mail, information retrieval systems, editors, and management information systems. DOE

N84-14796# Los Alamos Scientific Lab., N. Mex.
THE MIXPAC: A SUBROUTINE PACKAGE FOR CALCULATING EQUATIONS OF STATE FOR EQUILIBRIUM MIXTURES OF MATERIALS
C. W. Cranfill Aug. 1983 20 p refs
(Contract W-7405-eng-36)
(DE84-002302; LA-9861-M) Avail: NTIS HC A02/MF A01

This manual describes MIXPAC, a subroutine package for calculating equations of state (i.e., thermodynamic and transport properties) for plasmas composed of equilibrium mixtures of materials. The package is vectorized for the Los Alamos Cray-1 computers and uses EOSPAC, another vectorized subroutine package, to access the Los Alamos Sesame EOS data library. Each mixture is forced to be in equilibrium through the constraints that all its constituents have the same values for two state functions (e.g., temperature and pressure). The desired equations of state (including first partial derivatives) are then calculated for the mixture consistent with these constraints. All equations of state available for pure materials through EOSPAC are available for equilibrium mixtures through MIXPAC. DOE

N84-14797# North Central Forest Experiment Station, St. Paul, Minn.
MICROCOMPUTER SCIENTIFIC SOFTWARE SERIES 1: THE NUMERICAL INFORMATION MANIPULATION SYSTEM Final Report
Harold M. Rauscher 15 Sep. 1983 50 p Sponsored by Dept. of Agriculture 3 Vol.
(PB83-263624; FSGTR-NC-84) Avail: NTIS HC A03/MF A01 CSCL 09B

The numerical information manipulation system extends the versatility provided by word processing systems for textural data manipulation to mathematical or statistical data in numeric matrix form. Numeric data, stored and processed in the matrix form, may be manipulated in a variety of ways. The system allows operations on single statements, entire rows, or columns, or on entire data matrices. Data elements may be transformed by logarithmic, power, exponential, and other operations. When data sets are treated as a single matrix unit, they may be added, subtracted, multiplied, inverted, and separated or merged in any desired configuration. GRA

N84-14798# North Central Forest Experiment Station, St. Paul, Minn.
MICROCOMPUTER SCIENTIFIC SOFTWARE SERIES 2: GENERAL LINEAR MODEL-REGRESSION
Harold M. Rauscher 15 Sep. 1983 56 p Sponsored by Dept. of Agriculture 3 Vol.
(PB83-263632; FSGTR-NC-85) Avail: NTIS HC A04/MF A01 CSCL 09B

The general linear model regression (GLMR) program provides the microcomputer user with a sophisticated regression analysis capability. The output provides a regression ANOVA table, estimators of the regression model coefficients, their confidence intervals, confidence intervals around the predicted Y-values, residuals for plotting, a check for multicollinearity, a check for autocorrelation, and the scaled regression coefficients. A plotting routine is part of the regression program to facilitate quick plotting of residuals. GRA

N84-14799# North Central Forest Experiment Station, St. Paul, Minn.
MICROCOMPUTER SCIENTIFIC SOFTWARE SERIES 3: GENERAL LINEAR MODEL-ANALYSIS OF VARIANCE
Harold M. Rauscher 15 Sep. 1983 40 p Sponsored by Dept. of Agriculture 3 Vol.
(PB83-263640; FSGTR-NC-86) Avail: NTIS HC A03/MF A01 CSCL 09B

A BASIC language set of programs, designed for use on microcomputers is presented. This set of programs will perform the analysis of variance for any statistical model describing either balanced or unbalanced designs. The program computes and displays the degrees of freedom, Type 1 sum of squares, and the mean square for the overall model, the error, and each factor in the model. GRA

N84-14800# Texas Univ., Austin.
A LANGUAGE FOR THE SPECIFICATION AND REPRESENTATION OF PROGRAMS IN A DATA FLOW MODEL OF COMPUTATION Ph.D. Thesis
Sang Yong Han 1983 225 p
Avail: Univ. Microfilms Order No. DA8319598

A functional data flow language which is efficiently executed on the Texas Reconfiguable Array Computer (TRAC) is defined and analyzed. The major issues which must be considered in the design and implementation of a data flow programming system are the representation and specification of parallel structures by a data flow language, the time of binding, the specification of computation units and the attainment of maximum parallelism. The research consists of analyzing each of the solution options of these issues in the context of the TRAC architecture and selection of the appropriate solutions. The data flow language designed explores the representation capabilities of a data flow model for parallelism to specify total data flow language system. The data flow language is for function level parallelism. Thus the execution unit size is a function. The language can not only specify various types of parallelism but also be efficiently implemented on the TRAC. Dissert. Abstr.

62 COMPUTER SYSTEMS

Includes computer networks.

N84-14801 Texas Univ., Austin.
PERFORMANCE ANALYSIS OF LOOSELY COUPLED COMPUTER SYSTEMS Ph.D. Thesis
M. Seethalakshmi 1983 81 p
Avail: Univ. Microfilms Order No. DA8319681

A method for evaluating the performance of loosely coupled systems is presented. Two approximation techniques for analyzing the subsystems (CPU and shared I/O subsystems) are developed. Then, a hierarchical procedure for combining the subsystem analyses to determine the overall system performance is described. The first approximation technique is for analyzing CPU subsystems when the CPU is scheduled according to a preemptive priority discipline. It is based on the Mean Value technique. An expression for mean wait time experienced by each job class at the priority server is derived. Other performance statistics are derived from the mean wait time and some known queueing theoretic formulae. The technique is useful for solving open, closed, and mixed (queueing) network models of computer systems. The second approximation technique is for analyzing shared disk subsystems. Here, a model, which explicitly includes the effects of shared I/O interconnections and access path selection policies, is developed. Then, an iterative scheme is used to solve the model and obtain the I/O response times and device utilizations. Dissert. Abstr.

N84-14802# Advanced Information and Decision Systems, Mountain View, Calif.
DISTRIBUTED HYPOTHESIS FORMATION IN DISTRIBUTED SENSOR NETWORKS Final Report, 15 Jul. 1981 - 30 May 1983
C. Y. Chong, S. Mori, E. Tse, and R. P. Wishner May 1983 272 p
(Contract MDA903-81-C-0333; ARPA Order 4272)
(AD-A133849; AI-DS-TR-1015-02) Avail: NTIS HC A12/MF A01 CSCL 17/2

This report presents research results on distributed situation assessment in a distributed sensor network (DSN). The area of multitarget tracking and classification has been chosen to investigate issues associated with distributed hypothesis formation and evaluation. A general theory for Bayesian multitarget tracking has been developed. This is used as the basis for specifying the processing architecture at each node in the DSN. Each node contains the Generalized Tracker/Classifier for processing of local sensor data, an information fusion module to integrate processed information from various nodes, and an information distribution module. The problem of removing redundant information in a general distributed estimation system has also been investigated. Simulation results to study various issues associated with distributed situation assessment are presented. Author (GRA)

N84-14803# Fondazione Ugo Bordoni, Rome (Italy).
SYSTEM HARDWARE FOR THE IMPLEMENTATION OF FRAME

PROTOCOL IN PACKET SWITCHED NETWORKS [REALIZZAZIONE IN HARDWARE DI UN SISTEMA PER L'IMPLEMENTAZIONE DEL PROTOCOLLO A LIVELLO DI TRAMA PER LE RETI A COMMUTAZIONE DI PACCHETTO]
Mario Salerno (Rome Univ.) Dec. 1981 28 p ref In ITALIAN
(FUB-58-1981) Avail: NTIS HC A03/MF A01

The electrical circuit and the management of a system which supports the levels one and two of a packet switched network and which may implement the HDLC protocol are described. The central processing unit is of Z-80 type. Memories are 4K EPROM and 4K RAM. The data toward the line are managed by the interface HDLC-C based on an Intel 8273 circuit, capable of managing entirely the first system level. Several choices are available for interfacing with level three. The monitor program which controls the entire system and in particular the HDLC 8273 is described. Author (ESA)

N84-14804# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF A NETWORK STRUCTURE FOR ALGORITHM TESTING [ANALISI DI UNA STRUTTURA DI RETE PER LA PROVA DI ALGORITMI]
Odoardo Brugia and Piero Filipponi Feb. 1983 14 p refs In ITALIAN
(FUB-1-1983) Avail: NTIS HC A02/MF A01

A network structure which models long distance communication networks and that can easily be generated by a computer for algorithm testing is described. The constraints defining the network include being a euclidean network; nodes uniformly distributed on a rectangular surface; each node may be connected to neighboring nodes only; each two nodes are connected by at least two paths; and the network is pseudoregular of order four. The system is analyzed to determine the variations of cardinality of two particular subsets which relate to maintaining the imposed constraints. The automatic generation of the proposed structure is also discussed. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N84-14805*# National Aeronautics and Space Administration, Washington, D. C.
AN OVERVIEW OF ARTIFICIAL INTELLIGENCE AND ROBOTICS. VOLUME 1: ARTIFICIAL INTELLIGENCE. PART C: BASIC AI TOPICS
William B. Gevarter Oct. 1983 53 p refs
(NASA-TM-85839; NAS 1.15:85839) Avail: NTIS HC A04/MF A01 CSCL 09B

Readily understandable overviews of search oriented problem solving, knowledge representation, and computational logic are provided. Mechanization, automation and artificial intelligence are discussed as well as how they interrelate. A.R.H.

N84-14806# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SOME REMARKS ON THE ROLE OF LOGIC IN KNOWLEDGE REPRESENTATION
David J. Israel Jul. 1983 27 p
(Contract N00014-77-C-0371)
(AD-A132534; BBN-5388) Avail: NTIS HC A03/MF A01 CSCL 05/7

The author presents a brief overview of some main aspects of the long-standing debate in Artificial Intelligence over the role of logic and logical formalisms in knowledge representation. GRA

N84-14807# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE SYNTACTIC THEORY OF BELIEF AND KNOWLEDGE
Andrew R. Haas Sep. 1983 89 p
(Contracts N00014-77-C-0378, N00014-78-C-0164; N00014-80-C-0197; Grant NSF IST-80-12419)
(AD-A133905; BBN-5368) Avail: NTIS HC A05/MF A01 CSCL 06/4

Artificial Intelligence programs must have common-sense knowledge. This includes knowledge about beliefs and knowledge. If we have a knowledge representation that can represent facts about beliefs and knowledge, and an adequate set of inference rules, we have taken the first step in building a program that can reason about beliefs and knowledge. The next step is to devise a search strategy: an algorithm that decides which inference rules to apply to which expressions to solve a problem. This paper proposes a representation and inference rules for reasoning about belief and knowledge. The core of the paper is a series of examples of representation and inference in the formal system. These examples describe the processes that create, store and use beliefs and knowledge. Perception, introspection, memory, inference and planning are all considered. Finally there is an appendix with proofs that the formalism works as claimed. GRA

N84-14808# Illinois Univ., Urbana. Coordinated Science Lab.
UNTUTORED CONCEPT LEARNING
Gerald DeJong Jun. 1983 8 p
(Contract F49620-82-K-0009; Grant NSF IST-81-20254; AF Proj. 2304)
(AD-A133766; AFOSR-83-0771TR) Avail: NTIS HC A02/MF A01 CSCL 06/4

This paper discusses explanatory schema acquisition, a learning technique with several interesting properties. It does not require a teacher or concept matching predicate to be provided. It does not rely on searching a concept space to produce generalizations. It can acquire a new concept based on only one input example, although later inputs might result in refinement of learned concepts. These features are made possible by taking a very knowledge-based approach. The concepts that are learned are problem-solving schemata. Thus, the technique is not applicable to all types of learning. However, it provides a unique perspective on a large and interesting class of learning. Author (GRA)

N84-14809# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE SMOOTHEST VELOCITY FIELD AND TOKEN MATCHING SCHEMES
A. L. Yuille Aug. 1983 12 p
(Contract N00014-80-C-0505)
(AD-A133633; AI-M-724) Avail: NTIS HC A02/MF A01 CSCL 20/6

This paper presents some mathematical results concerning the measurement of motion of contours. A fundamental problem of motion measurement in general is that the velocity field is not determined uniquely from the changing intensity patterns. They formulate the measurement of motion as the computation of the smoothest velocity field consistent with the changing contour. We analyze this Extremum principle and prove that it is closely related to a matching scheme for motion measurement which matches points on the moving contour that have similar tangent vectors. We then derive necessary and sufficient conditions for the principle to yield the correct velocity field. These results have possible implications for the design of computer visions systems, and for the study of human vision. GRA

N84-14810# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
HYPOTHESIZING CHANNELS THROUGH FREE-SPACE IN SOLVING THE FINDPATH PROBLEM
Bruce R. Donald Jun. 1983 60 p
(Contracts N00014-81-K-0494; N00014-80-C-0505; N00014-82-K-0334)
(AD-A133632; AI-M-736) Avail: NTIS HC A04/MF A01 CSCL 09/2

Channels are an encoding of free-space corresponding to the classes of paths within an environment. An implementation exploiting this global model of the connectivity of free-space was able to solve 2 dimensional find-path problems in several minutes which formerly took many hours. The algorithm is essentially a problem solving strategy using a homeomorphic reduction of the search space. Given a polyhedral environment, a technique is presented for hypothesizing a channel volume through the free space containing a class of sucessful collision-free paths. A set of geometric constructions between obstacle faces is proposed, and defined is a mapping from a field of view analysis to a direct local construction of free space. The algorithm has the control structure of a search which propagates construction of a connected channel towards a goal along a frontier of exterior free faces. Thus a channel volume starts out by surrounding the moving object in the initial configuration and grows towards the goal. Author

N84-14811# Houston Univ., Tex. Dept. of Electrical Engineering.
FAST ALGEBRAIC METHODS FOR MULTIVARIABLE CONTROL SYSTEMS Final Report, 1 Sep. 1980 - 31 Aug. 1983
Leang S. Shieh 1 Sep. 1983 14 p
(Contract DAAG29-80-K-0077)
(AD-A132719; ARO-17636.24-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several fast algebraic methods have been developed for the analysis and synthesis of multivariable control systems. Simple and quick methods based on the block-pulse functions and the matrix continued fractions have been derived for rapid model reduction, system identification, models conversion, rational matrix realization, and design of multivariable control systems. Also, computer-aided methods have been developed for determining the solvents, spectral factors of matrix polynomials and for evaluating the block partial fraction expansions of rational matrices. Furthermore, a quick algorithm based on the matrix sign function has been developed for rapid solution of matrix Riccati equation. The algorithm has successfully been applied to develop a fast suboptimal state-space self-tuner for linear stochastic multivariable systems. GRA

N84-14812# Sheffield Univ. (England). Dept. of Control Engineering.
DESIGN OF SMITH CONTROL SCHEMES FOR TIME-DELAY SYSTEMS BASED ON PLANT STEP DATA
A. Chotai, D. H. Owens, A. Raya, and H. M. Wang May 1983 28 p refs
(Grant SRC-GR/B/23250)
(RR-231) Avail: NTIS HC A03/MF A01

It is demonstrated that approximation ideas conceived for the design of multivariable feedback systems based on approximate plant models carry over to the design of Smith control schemes in the presence of mismatch. The approaches are very similar in structure, being based upon systematic use of plant step data obtained from plant tests or model simulations and producing both graphical frequency domain and simulation-based time-domain methods of off-line computer aided design. Stability and performance degradation can be analyzed and it is not necessary to obtain a detailed plant model to apply the results, provided that plant step data can be obtained or synthesized. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-14813*# California Inst. of Tech., Pasadena. Seismological Lab.
IMPACT AND EXPLOSION CRATER EJECTA, FRAGMENT SIZE, AND VELOCITY
John D. OKeefe and Thomas J. Ahrens [1983] 31 p refs
(NASA-CR-174578; NAS 1.26:174578) Avail: NTIS HC A03/MF A01 CSCL 12A

A model was developed for the mass distribution of fragments that are ejected at a given velocity for impact and explosion craters. The model is semi-empirical in nature and is derived from (1) numerical calculations of cratering and the resultant mass versus ejection velocity, (2) observed ejecta blanket particle size distributions, (3) an empirical relationship between maximum ejecta fragment size and crater diameter and an assumption on the functional form for the distribution of fragements ejected at a given velocity. This model implies that for planetary impacts into competent rock, the distribution of fragments ejected at a given velocity are nearly monodisperse, e.g., 20% of the mass of the ejecta at a given velocity contain fragments having a mass less than 0.1 times a mass of the largest fragment moving at that velocity. Using this model, the largest fragment that can be ejected from asteroids, the moon, Mars, and Earth is calculated as a function of crater diameter. In addition, the internal energy of ejecta versus ejecta velocity is found. The internal energy of fragments having velocities exceeding the escape velocity of the moon will exceed the energy required for incipient melting for solid silicates and thus, constrains the maximum ejected solid fragment size. M.G.

N84-14814# Air Force Geophysics Lab., Hanscom AFB, Mass.
TESTS OF AN INVERSION ALGORITHM FOR SPECTRALLY RESOLVED LIMB EMISSION
Ramesh D. Sharma and Alexander Zachor 1 Sep. 1983 6 p
Repr. from Appl. Optics, v.22, no. 17, 1 Sep. 1983 p 2665-2669
(AF Proj. 2310)
(AD-A134128; AFGL-TR-83-0274) Avail: NTIS HC A02/MF A01 CSCL 12/1

A nonlinear inversion algorithm used previously to invert real data obtained in the spectral infrared rocket experiment were studied. The tests attempted to retrieve singly and doubly peaked excited density vs altitude profiles and kinetic temperature vs altitude from the synthetic spectral data with and without added noise. A nonlinear inversion algorithm was used rather than the formal inverse of the Abel integral equation because it offers promise for species/bands that are not optically thin. GRA

N84-14815# Arizona State Univ., Tempe. Group for Computer Studies of Strategies.
ON SOME ISSUES CONCERNING OPTIMIZATION AND DECISION TREES Interim Report
Nicholas V. Findler, Michael S. Belofsky, and Timothy W. Bickmore 1983 18 p
(Grant AFOSR-82-0340; AF Proj. 2304)
(AD-A134109; GCSS-TR-14; TR-83-003; AFOSR-83-0780TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors describe the context and the constituent modules of a large-scale programming system, the Quasi-Optimizer. Its objectives are (a) to observe and measure adversaries' behavior in a competitive environment, to infer their strategies and to construct a computer model, a descriptive theory of each; (b) to identify strategy components, evaluate their effectiveness and to select the most satisfactory ones from a set of descriptive theories; (c) to combine these components in a quasi-optimum strategy that represents a normative theory in the statical sense. Also discussed are certain properties of decision trees which are the primary representational structures of strategies in the computer. The verification of these properties, such as identity, equivalence and similarity between two decision subtrees, enable us to eliminate redundancies in the decision trees. GRA

N84-14816# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
EXACT PERFORMANCE OF GENERAL SECOND-ORDER PROCESSORS FOR GAUSSIAN INPUTS
Albert H. Nuttall 15 Oct. 1983 70 p
(ZR00001)
(AD-A134098; NUSC-TR-7035) Avail: NTIS HC A04/MF A01 CSCL 12/1

The characteristic functions of general second-order processors with nonstationary nonzero mean Gaussian inputs is derived in closed form. Three classes of processors are considered: in the first, the decision variable is the sum of K independent terms, each of second-order form involving two statistically dependent Gaussian random variables; the second class of processor is a narrowband cross-correlator of arbitrary Gaussian processes, with accumulation of K independent low pass filter output samples; in the third class, the decision variable is a general quadratic-plus-linear form of M random variables, all statistically dependent on each other. Specializations to various forms of weighted energy detectors and correlators are made. Also, the characteristics function for the first class of processor subject to fading is evaluated. Programs for evaluating the cumulative and exceedance distribution functions of all three classes of processors are given and have been used to plot representative examples of performance. A comparison with a simulation result corroborates the analysis and program of the first class of processor. GRA

N84-14817# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
BAYES SMOOTHING ALGORITHMS FOR SEGMENTATION OF IMAGES MODELLED BY MARKOV RANDOM FIELDS Final Technical Report
Haluk Derin, Howard Elliott, Roberto Cristi, and Donald Geman Aug. 1983 45 p
(Contract N00014-83-K-0059)
(AD-A133966; UMASS-ECE-AUG83-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new image segmentation algorithm is presented, based on recursive Bayes smoothing of images modelled by Markov random fields and corrupted by independent additive noise. The Bayes smoothing algorithm yields the a posteriori distribution of the scene value at each pixel, given the total noisy image, in a recursive way. The a posteriori distribution together with a criterion of optimality then determine a Bayes estimate of the scene. Examples are given where the algorithm is applied to test imagery and also SEASAT SAR imagery. GRA

N84-14818# Ohio State Univ., Columbus. Dept. of Psychology.
INVESTIGATION OF AN ERROR THEORY FOR CONJOINT MEASUREMENT METHODOLOGY Final Technical Report, 1 Mar. 1982 - 31 Mar. 1983
Thomas E. Nygren May 1983 170 p
(Grant AF-AFOSR-0175-82; AF Proj. 2313)
(AD-A133946; AFOSR-83-0860TR) Avail: NTIS HC A08/MF A01 CSCL 12/1

This report presents the results of an attempt to propose a basis for an error theory of conjoint measurement methodology. Conjoint measurement methodology offers a new and potentially useful approach for obtaining psychological scale values for components of multidimensional attributes. This report describes the mathematical foundations of this methodology as well as a means of evaluating the fit of an additive conjoint measurement model to a three factor design. For each of the critical axioms of conjoint measurement, proportions of errors that would be expected by chance for different conditions of simple independence are examined. In addition, a computer-based algorithm that can be used to perform specific kinds of conjoint analysis has been generalized and documented as a technique for assessing the fit of an additive model to a set of data. The program is called SWAT and its current state of development is described in this report. Finally, the appendices provide a step-by-step explanation of data deck arrangements for SWAT as well as some actual printouts from the program. GRA

N84-14819# Wright State Univ., Dayton, Ohio. Dept. of System Engineering.
A GENERAL MEASUREMENT DESIGN PHILOSOPHY FOR THE KALMAN FILTER ESTIMATION WITH SPECIAL APPLICATION GIVEN TO THE IMAGING RADAR AUTOFOCUS UPDATE Final Report, 1 May 1982 - 30 Apr. 1983
William S. McCormick 1983 91 p
(Grant AF-AFOSR-0127-82; AF Proj. 2305)
(AD-A133895; AFOSR-83-0857TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

The value of an Autofocus update of an INS is investigated. Three cases are considered: (1) centripedal acceleration only; (2) centripedal and line-of-sight acceleration; and (3) centripedal and line-of-sight acceleration as well as attitude error effects. The extended kalman filter configuration was employed using the versatile SOFE Monte Carlo simulation program. Measurement matrices were defined for each of the three cases. Simulation results indicated an observability problem for Case (1). Suggestion for further work was included. For the centripedal acceleration case only, the Autofocus measurement proved to be a useful measurement when supplemented by additional measurements. In particular, a Compass, an Autofocus, and Doppler velocity update realize better than a 94% update quality. Without the Autofocus, the quality suffers greatly. Author (GRA)

N84-14820# Wyoming Univ., Laramie. Dept. of Electrical Engineering.
OPTIMAL DELAY ESTIMATION IN A MULTIPLE SENSOR ARRAY HAVING SPATIALLY CORRELATED NOISE Annual Technical Report, 1 Nov. 1982 - 31 Oct. 1983
R. Lynn Kirlin and Lois A. Dewey 30 Sep. 1983 68 p
(Contract N00014-82-K-0048; NR Proj. 042-470)
(AD-A133810) Avail: NTIS HC A04/MF A01 CSCL 12/1

The maximal likelihood estimation of time-of-arrival differences for signals from a single source or target arriving at M > or = sensors has been the subject of a large number of papers in recent years. These time differences or delays enable target location. Nearly all previous work has assumed noises which are independent among all sensors. Herein noises are taken to have a complex correlation between sensors. A set of nonlinear equations in the unknown delays is derive d and possible simplifications discussed. The unknowns are in one case the M-1 delays referred to the first sensor and in another case an M-1 dimensional subset of independent delays from the M(M-1)/2 pairwise delays. The Fisher information matrix (FIM) for the estimates is also derived. The Cramer Rao Matrix Bound (CRMB), which is the inverse of FIM, will show optimal estimator covariances; these are different than the covariances of correlator delay estimators derived by Hahn. Computer evaluations are given for CRMB elements with varied SNR and noise covariance values typical of turbulent boundary layer noise in towed arrays. Author (GRA)

N84-14821# Rensselaer Polytechnic Inst., Troy, N. Y. Dept of Mathematical Sciences.
NUMERICAL METHODS FOR SINGULARLY PERTURBED DIFFERENTIAL EQUATIONS WITH APPLICATIONS Interim Scientific Report, 1 Jun. 1982 - 31 May 1983
Joseph E. Flaherty Jul. 1983 15 p
(Grant AF-AFOSR-0192-80; AF Proj. 2304)
(AD-A133741; AFOSR-83-0810TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period covered by this report the investigators continued their research on the development and application of numerical methods for singularly-perturbed (or stiff) boundary value problems for ordinary differential equations and initial-boundary value problems for partial differential equations. Results were obtained for collocation methods for vector systems of two-point boundary value problems and for adaptive grid finite element methods to several interesting physical problems, such as, the deformation of nonlinear elastic and plastic beams and a nonlinear Schrodinger equation which exhibits self focusing. Author (GRA)

N84-14822# Wisconsin Univ., Madison. Dept. of Computer Sciences.
SOLVING ELLIPTIC-PARABOLIC PROBLEMS Interim Report, 15 Jun. 1982 - 14 Jun. 1983
Seymour V. Parter Jun. 1983 9 p
(Grant AF-AFOSR-0275-82; AF Proj. 2304)
(AD-A133726; AFOSR-83-0824TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The original proposal to AFOSR suggested that the major emphasis of this research would be on Solving Elliptic-Parabolic Problems. Three topics of special interest follow. (1) The extension of the basic theory (originally developed for finite-difference equations) of Professor Parter and his co-workers to those algebraic systems which arise in the finite-element approach to elliptic and parabolic problems. (2) The study of multi-grid methods. (3) A continuing experimental/analytical study of special splittings in the generalized conjugate gradient methods for elliptic and parabolic problems. Author (GRA)

N84-14823# Naval Underwater Systems Center, New London, Conn.
OPTIMUM FILTERING REQUIRED FOR BROADBAND DETECTION OF GAUSSIAN PROCESSES
Ira B. Cohen and Albert H. Nuttall 22 Sep. 1983 31 p
(AD-A133721; NUSC-TR-6999) Avail: NTIS HC A03/MF A01 CSCL 12/1

The derivation for the optimum filter required for broadband detection of Gaussian processes is presented. The performance criteria that is optimized is probability of detection for a fixed false alarm rate. It is shown by example that the optimum filter out performs the widely used Eckart filter and other filters. Author (GRA)

N84-14824# Boeing Computer Services Co., Tukiwila, Okla. Energy Technology Applications Div.
ORDERING METHODS FOR SPARSE MATRICES Final Report, Jul. 1981 - Jul. 1983
John G. Lewis 28 Jul. 1983 9 p
(Contract F49620-81-C-0072; AF Proj. 2304)
(AD-A133657; AFOSR-83-0819TR; FR-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document describes the performance of five tasks: creation of a comprehensive test matrix collection, analysis of the Hellerman-Rarick P4 algorithm, production of a P4 code, production of a diagnostic code, and comparative analysis of several algorithms using the test matrices and the diagnostic code. Reports on the completion of the five tasks are given, relevant reports and publications of project personnel are listed and related sparse matrix activities are discussed. GRA

N84-14825# California Univ., Santa Barbara. Inst. for the Interdisciplinary Applications of Algebra and Combinatorics.
STABILITY ANALYSIS FOR DIFFERENCE SCHEMES, PROBLEMS IN APPLIED LINEAR ALGEBRA, AND APPLICATION OF NUMBER THEORY TO COMPUTING Final Scientific Report, 1 Oct. 1979 - 30 Apr. 1983
Moshe Goldberg, Marvin Marcus, Henryk Minc, Morris Newman, and Robert C. Thompson Jul. 1983 42 p
(Grant AF-AFOSR-0127-79; AF Proj. 2304; AF Proj. 9749)
(AD-A133654; AFOSR-83-0823TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Document describes research consisting mainly of the following topics: (1) Convenient stability criteria for finite difference approximations to hyperbolic initial-boundary value problems: theory and applications. (2) Operator norms, matrix norms, and multiplicativity. (3) Generalizations of the Perron-Frobenius Theorem and localization of eigenvalues with maximal absolute value. GRA

N84-14826# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELLIPSOID ALGORITHM VARIANTS IN NONLINEAR PROGRAMMING Ph.D. Thesis - Rensselaer Polytechnic Inst.
Stephen T. Dziuban Aug. 1983 274 p
(AD-A132599; AFIT/CI/NR-83-36D) Avail: NTIS HC A12/MF A01 CSCL 12/1

This thesis presents and evaluates variants of the ellipsoid algorithm for nonlinear programming. Two primary types of variants are examined: different deep cut hyperplanes, and different strategies for testing the feasibility constraints. Five of the deep cut variants do not require a linesearch, while three do require a linesearch. Of the five constraint examination methods, three are alternative ways of examining the full list of feasibility constraints. The fourth method is an active set strategy, while the fifth uses a record objective function value constraint. The variants are tested on 13 general and geometric programming problems, both convex and nonconvex. The performance of each variant is measured in combined solution error as a function of solution time. The experimental results show that the lowest solution error achieved is essentially unaffected by the constraint examination strategy. However, all but one of the deep cut variants occasionally converge to non-optimal points if the problem is nonconvex. GRA

N84-14827# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.
ESTIMATION OF PARAMETERS FOR TRUNCATED DISTRIBUTIONS Progress Report, 1-27 Oct. 1980
Ronald O. Pennsyle Jun. 1983 19 p Supersedes ARCSL-TM-81001
(DA Proj. 1L1-62706-A-554)
(AD-A132605; ARCSL-SP-83006; ARCSL-TM-81001) Avail: NTIS HC A02/MF A01 CSCL 12/1

Truncated distributions are frequently encountered in the experimental determination of size distributions of aerosols, dusts, and other collections of small particles. A technique for determining maximum likelihood estimates of the geometric mean and standard deviation of a truncated lognormal distribution has been found in the published literature and implemented in a BASIC computer program. This special publication describes the method and the computer program. Author (GRA)

N84-14828# Army Armament Munitions and Chemical Command, Rock Island, Ill. Systems and Operations Analysis Directorate.
METHODS FOR CHOOSING BUFFER SIZE IN TANDEM PRODUCTION OPERATIONS Final Report
George J. Schlenker Aug. 1983 75 p
(AD-A132639; DRSMC/SA/MR-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

This memorandum is concerned with the problem of selecting a capacity value for the buffer between two asynchronous production operations. The methodology study is motivated by shortcomings in present methods. Objectives for this study are that methods should be at least as efficient as stochastic simulation and that they should provide a means of examining both the utilization of the buffer and the productivity of the manufacturing process. Two methods were developed and implemented in computer programs. Both methods use the theory of Markov processes. The first method (GS.BUF) calculates steady-state probabilities for all states of a simple production system. For certain types of processes the results of this model are exact. The results offer a good approximation for many processes. This model calculates the system productivity explicitly, providing an opportunity for economic tradeoffs between buffer capacity and other parameters. The second model (BUF.CAP) focuses on the dynamics of the filling and emptying of the buffer, under the assumption of statistical independence between states of the two operations. This model admits the possibility of several machines working in parallel at each operation. Author (GRA)

N84-14829# Wisconsin Univ., Madison. Mathematics Research Center.
INITIAL-BOUNDARY VALUE PROBLEMS FOR LINEAR HYPERBOLIC SYSTEMS
Robert L. Higdon Aug. 1983 75 p
(Contracts DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A132644; MRC-TSR-2558) Avail: NTIS HC A04/MF A01 CSCL 12/1

We discuss and interpret a theory developed by Kreiss and others for studying the suitability of boundary conditions for linear hyperbolic systems of partial differential equations. The existing theory is extremely technical. The present discussion is based on the characteristic variety of the system. The concept of characteristic variety leads to: (1) a physical interpretation of the theory in terms of wave propagation; (2) a physical and geometrical method for visualizing the algebraic structure of the system. The great complexity of the theory is caused by certain aspects of this structure. We also point out connections between the above work and a corresponding theory regarding the stability of finite difference approximations. Author (GRA)

N84-14830# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.

EXPRESSIONS FOR THE EXACT STATE TRANSITION MATRIX OF A NINE-STATE TARGET MODEL
Wayne L. McCowan and Keith Higginbotham Aug. 1983 39 p
(AD-A132652; DRSMI/RG-83-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

Several expressions have been developed for the exact state transition matrix associated with a time-invariant, 9x9 target state matrix. Each form results from a different combination of allowable parameter values representing the specified bandwidths in the differential equations describing the target acceleration components along three orthogonal coordinate axes.
Author (GRA)

N84-14831# Science Applications, Inc., Pleasanton, Calif.
MOVING FINITE ELEMENTS IN 2-D Final Report, 30 Jun. 1982 - 30 Jun. 1983
Robert J. Gelinas 30 Jun. 1983 17 p
(Contract DAAG29-81-C-0020)
(AD-A132700; SAI-83/1010; ARO-17975.2-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research was an effort to explore further the promise of the moving finite element method for the solution of difficult large-gradient PDE problems in 2-D. The results of this research indicate that: (i) the MFE method does extend logically and practically to 2-D, and (ii) extensive continuing research is needed in several task areas in order to advance further applications of the MFE method, per se, and to also pursue further advances which are essential to all adaptive PDE solution methods.
Author (GRA)

N84-14832# Colorado Univ., Boulder. Dept. of Chemical Engineering.
A GALERKIN-FINITE ELEMENT TECHNIQUE FOR SMALL-SCALE ATMOSPHERIC FLOWS AND TRANSPORT OVER GENERAL TERRAIN Final Report, 1979 - 1983
R. L. Sani 30 Aug. 1983 37 p
(Contract DAAG29-82-C-0010; Grant DAAG29-79-G-0045)
(AD-A132735; Rept-153-1836; ARO-15810.9-GS) Avail: NTIS HC A03/MF A01 CSCL 12/1

The development of a consistent penalty Galerkin finite element algorithm for small-scale atmospheric flows over complex terrain is summarized. Various aspects of the development such as pressure smoothing, the development of an appropriate variable step time integrator, and appropriate outflow boundary conditions are discussed and pertinent references cited. Illustrative simulations are presented.
GRA

N84-14833# Florida State Univ., Tallahassee. Dept. of Statistics.
CONVEX-ORDERING AMONG FUNCTIONS, WITH APPLICATIONS TO RELIABILITY AND MATHEMATICAL STATISTICS
Wai Chan, Frank Proschan, and Jayaram Sethuraman Jul. 1983 19 p
(Contract DAAG29-82-K-0168; Grants AF-AFOSR-0007-82)
(AD-A132796; FSU-STATISTICS-M661; ARO-19367.6; AFOSR-83-158TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Hardy, Littlewood and Polya (1934) introduced the notion of one function being convex with respect to a second function and developed some inequalities concorning the means of the functions. We use this notion to establish a partial order called convex-ordering among functions. In particular, the distribution functions encountered in many parametric families in reliability theory are convex-ordered. We have formulated some inequalities which can be used for testing whether a sample comes from F or G, when F and G are within the same convex family. Performance characteristics of different coherent structures can also be compared with respect to this partial ordering. For example, we will show that the reliability of a k+l-out-of-n system is convex with respect to the reliability of a k-out-of-n system. When F is convex with respect to G, the tail of the distribution F is heavier than that of G; therefore, our convex ordering implies stochastic ordering. The ordering is also related to total positivity and monotone likelihood ratio families. This provides us a tool to obtain some useful results in reliability and mathematical statistics.
GRA

N84-14834# Wisconsin Univ., Madison. Mathematics Research Center.
NUMERICAL ANALYSIS OF BOUNDARY VALUE PROBLEM OF ELLIPTIC TYPE BY MEANS PENALTY AND THE FINITE DIFFERENCE AND ITS APPLICATION TO FREE BOUNDARY PROBLEM
T. Hanada, H. Kawarada (Tokyo Univ., Japan), and O. Pironneau (Paris-Nord Univ., France) Jul. 1983 47 p
(Contract DAAG29-80-C-0041)
(AD-A132805; MRC-TSR-2541) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors study a numerical method for solving free boundary problems of elliptic type. Usually these problems are prescribed with two boundary conditions on the free boundary. One of them is the Dirichlet condition and the other is the Neumann condition. Their method is to transform the original problem to an optimization problem. The state equation is approximated by an equation with a penalty term in which the Dirichlet condition on the free boundary is approximately satisfied. The outward normal derivative included in the Neumann condition through the free boundary is calculated by using the asymptotic behavior of the solution of the penalized state equation. Presented is a method to solve this penalized optimization problem. Also the error estimate of the discretized state equation by the finite difference method is given.
Author (GRA)

N84-14835# Wisconsin Univ., Madison.
THE 1-DIMENSIONAL STRUCTURED PHASE TRANSFORMATIONS UNDER PRESCRIBED LOADS
Jack Carr, Morton E. Gurtin, and Marshall Slemrod Aug. 1983 20 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0002; Grants NSF MCS-81-02380; AF-AFOSR-0172-81)
(AD-A132807; MRC-TSR-2559) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors consider a one-dimensional elastic bar acted on by end loads. To allow for the possibility of phase transitions they consider a stored-energy function of the form W(gamma) + epsilon sub 2(gamma')sub 2 with W(gamma) a nonconvex function of strain gamma, a function of the type capable of supporting two-phases. The term involving the strain gradient gamma, is added to model the region of rapidly varying strain in the vicinity of a phase transition. It is shown that this problem has smooth solutions which, for epsilon small, correspond to the single-phase and two-phase solutions of the problem with epsilon = O. It is shown further that the only stable solutions of this problem are the single-phase solutions gamma = constant.
Author (GRA)

N84-14836# Wisconsin Univ., Madison. Mathematics Research Center.
CENTRAL CONFIGURATIONS OF THE N-BODY PROBLEM
Filomena Pacella (Naples Univ.) Jun. 1983 17 p
(Contract DAAG29-80-C-0041)
(AD-A132820; MRC-TSR-2534) Avail: NTIS HC A02/MF A01 CSCL 12/1

An important problem in celestial mechanics is to find the central configurations of the N-body problem. This problem is equivalent to looking for critical points of the relevant potential function over a manifold on which a group of symmetries acts. The so-called collinear problem is well understood. While many important results have been obtained about the N-body problem in the plane, as far as it is known there are no results about this problem in space. In this paper the author use topological methods, in particular Morse theory and the equivalent homology, to obtain a first estimate on the minimal number of spatial central configurations. Then, using known results for the collinear and planar she improves this estimate and is able to give an inferior bound on the number of those central configurations which are not planar in the sense that not all the bodies lie on the same plane.
GRA

N84-14837# Wisconsin Univ., Madison. Mathematics Research Center.

STABILIZATION OF SOLUTIONS FOR A CLASS OF PARABOLIC INTEGRO-DIFFERENTIAL EQUATIONS

Hans Engler Aug. 1983 56 p Sponsored in part by Deutsche Forschungsgeineinschaft
(Contract DAAG29-80-C-0041)
(AD-A132821; MRC-TSR-2555) Avail: NTIS HC A04/MF A01 CSCL 12/1

Integro-differential equations arise in the description of feed-back control systems, where the control variables are derived from filtered observations of the state or where the control mechanism possesses inertia. The author studies a model equation for a distributed control system (e.g., the state varies over some space-like domain) which contains also some diffusion effects and give conditions under which the state will tend to some limit, as time goes to infinity, regardless of the initial situation. The limit is shown to satisfy an elliptic differential equation. Convergence rates are also given; these show the slowing-down effect of a slow control mechanism on the convergence of the state variable. The problem under study can also be viewed as a natural extension of a type of reaction-diffusion equation that has received wide attention in the literature. Author (GRA)

N84-14838# Wisconsin Univ., Madison. Mathematics Research Center.

NUMERICAL ANALYSIS OF A STEFAN PROBLEM

Hideo Kawarada (Tokyo Univ.) and C. Saguez (Inst. National de Recherche) Jul. 1983 48 p
(Contract DAAG29-80-C-0041)
(AD-A132823; MRC-TSR-2543) Avail: NTIS HC A03/MF A01 CSCL 12/1

We can observe many phenomena involving Free Boundaries in various fields of engineering and applied sciences, for example, free boundary problems in optimum design, the pollution of air and water, the equilibrium of plasma. For such problems it is important to develop reliable computational methods which are practically efficient in applications. Naturally, a crucial point in numerical methods for free boundary problem is how to deal with the moving boundary. In order to meet this difficulty, various approaches have been proposed; they can be classified into two groups. One of them is to follow the free boundary directly. The other is to transform the original problem into an auxiliary problem with a fixed boundary. The author's technique uses the penalty method and falls into the second group. In this paper they apply this method to the Stefan problem which arises in the analysis of melting of ice adjacent to a heated body of water. The essential idea of their method is to transform the Stefan problem into an initial-boundary value problem for the heat equation defined in a cylindrical domain, occupied jointly by water and ice, with an artificial heat absorption in the ice region. Their formulation is closely related to the approach using variational inequalities. GRA

N84-14839# Wisconsin Univ., Madison. Mathematics Research Center.

A COLLOCATION METHOD FOR COMPUTING EIGENVALUES AND EIGENFUNCTIONS OF THE LAPLACIAN

Lothar Reichel Jul. 1983 23 p
(Contract DAAG29-80-C-0041)
(AD-A132827; MRC-TSR-2546) Avail: NTIS HC A02/MF A01 CSCL 12/1

A boundary collocation method is presented for the computation of eigenvalues and eigenfunctions of the Laplacian on bounded simply connected plane regions with smooth boundary. Particular emphasis is placed on the selection of an appropriate function space and its basis for the approximation of the eigenfunctions. Numerical examples are presented. Author (GRA)

N84-14840# Wisconsin Univ., Madison. Mathematics Research Center.

CAUCHY FLUX AND SETS OF FINITE PERIMETER

William P. Ziemer (Indiana Univ.) Aug. 1983 31 p Sponsored in part by NSF
(Contract DAAG29-80-C-0041)
(AD-A132834; MRC-TSR-2556) Avail: NTIS HC A03/MF A01 CSCL 12/1

A Cauchy flux Q is a real-valued, additive, area-bounded function whose domain is the class of all Borel subsets of the reduced boundary of sets of finite perimeter. If the flux Q is also volume bounded, it is shown that Q can be represented as the integral of the normal component of some vector field. Author (GRA)

N84-14841# Wisconsin Univ., Madison. Mathematics Research Center.

IMPLEMENTATION OF A SUDGRADIENT PROJECTION ALGORITHM II

Robert W. Owens (Lewis and Clark Coll.) Aug. 1983 22 p
(Contract DAAG29-80-C-0041)
(AD-A132835; MRC-TSR-2550) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper discusses the implementation of a subgradient projection algorithm due to Sreedharan for the minimization, subject to a finite number of smooth, convex constraints, of an objective function which is the sum of a smooth, strictly convex function and a piecewise smooth convex function. Computational experience with the algorithm on several test problems and comparison of this experience with previously published results is presented. Author (GRA)

N84-14842# Wisconsin Univ., Madison. Mathematics Research Center.

A COORDINATE TRANSFORMATION FOR THE POROUS MEDIA EQUATION THAT RENDERS THE FREE-BOUNDARY STATIONARY

Morton E. Gurtin, Richard C. MacCamy, and Eduardo A. Socolovsky Aug. 1983 25 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0002; Grants NSF MCS-80-01944; NSF MCS-81-02380)
(AD-A132839; MRC-TSR-2560) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider the one-dimensional porous media problem ut = u square xx' u(0, x) = u0(x) for initial data sub uo which vanishes outside a finite interval. Solutions of this problem contain a free boundary separating points (t,x) with u(t,x) > 0 from those with u(t,x) = 0. We deduce a coordinate transformation x = X(t,p) which renders this free boundary stationary in time. We describe a simple difference scheme based on this transformation and show that, even with a fairly crude mesh, the free boundary is tracked quite accurately. GRA

N84-14843# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

SHAPE RECOGNITION AND DESCRIPTION: A COMPARATIVE STUDY

Timothy A. Grogan and O. Robert Mitchell Jul. 1983 280 p Sponsored in part by the Rome Air Development Center
(Contract DAAG29-81-K-0088)
(AD-A132842; TR-EE-83-22; ARO-18016.11-EL-A) Avail: NTIS HC A13/MF A01 CSCL 12/1

Several methods of analyzing binary images using global shape methods based upon functional approximation have been reported in the literature. However, there has been a lack of information comparing the effectiveness of these methods in shape analysis. Five methods of global shape analysis are compared on two bases: (1) Fourier descriptors of the boundary; (2) Walsh points of the boundary; (3) the cumulative angular deviant Fourier descriptors; (4) moments of the silhouette; and (5) moments of the boundary. First, the different methods are introduced, their geometric properties presented, and the formulae for some generic shapes are provided. The methods are compared on the basis of the empirical facts derived from a set of aircraft shape recognition experiments. The shapes are different views of six aircraft. The aircraft silhouettes are the two-dimensional projected images of three-dimensional rigid bodies. The five methods are ranked according to their performance from these experiments. A new method for the recognition of partial shapes based on the Fourier-Mellin transform is introduced. A shift and scale invariant correlation of the complete and partial shape's curvature functions is obtained by applying the Mellin transform to the magnitude of the Fourier transform of the curvature functions. The logarithm of the shift in the correlation function corresponds to the time scaling of the partial shape's curvature function. Then the shift in an ordinary correlation of the complete shape's curvature is the time shift necessary to complete the alignment. Then a pointwise comparison of the curvature functions can be made to determine matching and non-matching contour segments. GRA

N84-14844# Wisconsin Univ., Madison. Mathematics Research Center.

A 3-COMPONENT SYSTEM OF COMPETITION AND DIFFUSION

Masayasu Mimura and Paul C. Fife Aug. 1983 27 p
(Contract DAAG29-80-C-0041)
(AD-A132860; MRC-TSR-2557) Avail: NTIS HC A03/MF A01
CSCL 12/1

This report studies the existence of non-constant solutions of certain two-point boundary value problems for 3-component systems with a small parameter epsilon, under homogeneous Neumann conditions at the boundaries. This problem is related to the analysis of segregation patterns in population models of 3-competing and spatially dispersing species. It is shown that the reduced problem (epsilon = 0) has many non-constant solutions exhibiting spatial segregation. Only a few of these, however, can serve as valid lowest-order approximations to solutions of the original problem when epsilon is non-zero but small. A singular perturbation construction clarifies which are in this category. The results of numerical computations of solutions are also illustrated. Author (GRA)

N84-14845# Wisconsin Univ., Madison. Mathematics Research Center.

DIRECTED GRAPHS AND TRAVELING WAVES

David Terman Jul. 1983 66 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A132861; MRC-TSR-2545) Avail: NTIS HC A04/MF A01
CSCL 12/1

The equation studied here has been considered as a model for a variety of physical phenomena including population genetics and nerve conduction. Of primary interest is the limiting behavior of solutions of this equation. One expects the solution eventually to look like a traveling wave solution; that is, one which moves with constant shape and velocity. This paper determines all of the traveling wave solutions of the equation, showing there are situations when the number of traveling wave solutions can be infinite. GRA

N84-14846# Wisconsin Univ., Madison. Mathematics Research Center.

MORE RESULTS ON THE CONVERGENCE OF ITERATIVE METHODS FOR THE SYMMETRIC LINEAR COMPLEMENTARITY PROBLEM

Jong-Shi Pang Aug. 1983 43 p
(Contract DAAG29-80-C-0041; Grant NSF ECS-81-14571)
(AD-A132863; MRC-TSR-2552) Avail: NTIS HC A03/MF A01
CSCL 12/1

In an earlier paper, the author has given some necessary and sufficient conditions for the convergence of iteractive methods for solving the linear complementarity problem. These conditions may be viewed as global in the sense that apply to the methods regardless of the constant vector in the linear complementarity problem. More precisely, the conditions characterize a certain class of matrices for which the iteractive methods will converge, in a certain vectors. In this paper, we improve on our previous results and establish necessary and sufficient conditions for the convergence of iteractive methods for solving each individual linear complementarity problem with a fixed constant vector. Unlike the earlier paper, our present analysis applies only to the symmetric linear complementarity problem. Various applications to a strictly convex quadratic program are also given. Author (GRA)

N84-14847# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.

COMPARISON OF ARITHMETIC REQUIREMENTS FOR THE PFA (PRIME FACTOR ALGORITHM), WFTA (WINOGRAD FOURIER TRANSFORM ALGORITHM), SWIFT, MFFT (MIXED RADIX FAST FOURIER TRANSFORM), FFT (FAST FOURIER TRANSFORM) AND DFT (DISCRETE FOURIER TRANSFORM) ALGORITHMS

Robert C. Hicks Nov. 1982 62 p
(AD-A133087; AD-E950434; DRSMI/RE-83-6-TR) Avail: NTIS HC A04/MF A01

This discrete Fourier transform (DFT) is a powerful reversible mapping transform for discrete data sequences with mathematical properties analogous to those of the Fourier transform. The DFT can be used for spectral analysis of time series, fast correlation of sequences, fast convolution of sequences for the purpose of digital filtering, and for radar digital beamforming. The ever increasing importance of the DFT algorithm has led to the development of several more efficient algorithms requiring far less arithmetic computations than the DFT. This report examines the multidimensional DFT decomposition theory central to many of these algorithms and gives a brief introduction to the radix-2 fast Fourier transform (FFT), radix-4 FFT, mixed radix fast Fourier transform (MFFT), prime factor algorithm (PFA), Winograd Fourier transform (WFTA), and SWIFT algorithms. In addition, the arithmetic complexity of these algorithms is compared for various one and two-dimensional transform sizes. Included in the comparison are the number of real additions, real multiplications, total real operations, total equivalent real multiplications, and integrated circuit chips required for each algorithm. Author (GRA)

N84-14848# Los Alamos Scientific Lab., N. Mex.

VECTORIZATION OF ALGORITHMS FOR SOLVING SYSTEMS OF ELLIPTIC DIFFERENCE EQUATIONS

B. L. Buzbee 1983 9 p refs Presented at the ASME Symp. on Impace of New Computing Systems on Computational Mech., Boston, 13-18 Nov. 1983
(Contract W-7405-eng-36)
(DE83-014125; LA-UR-83-1761; CONF-831111-3) Avail: NTIS HC A02/MD A01

Today's fastest computers achieve their highest level of performance when processing vectors. Consequently, considerable effort was spent in the past decade developing algorithms that are expressed as operations on vectors. Two types of vector architecture are defined. The variation of performance that can occur on a vector processor as a function of algorithm and implementation, the consequences of this variation, and the performance of some basic operators on the two classes of vector architecture are discussed. The performance of higher level operators, including some that should be used with caution are also discussed. Using both basic and high level operators, vector implementation of techniques for solving systems of elliptic difference equations was discussed. Included are fast Poisson solvers and point, line, and conjugate gradient techniques. DOE

N84-14849# Sheffield Univ. (England). Dept. of Control Engineering.

GEOMETRIC CONDITIONS FOR GENERIC STRUCTURE OF MULTIVARIABLE ROOT-LOCI

D. H. Owens Jun. 1983 17 p refs
(Grant SRC-GR/B/79455)
(RR-227) Avail: NTIS HC A02/MF A01

Using the properties of the inverse (A-pBC)-1 the asymptotic directions of the infinite zeros of the multivariable root-locus of a multivariable feedback system S(A,B,C) are characterized by constrained eigenvalue problems. Generic conditions for the existence of only integer order infinite zeros are identified in terms of subspaces in the (A,B) invariance algorithm and its dual. Major assumptions in the analysis are that the system is invertible with no pole or zeros at the origin of the complex plane. Origin shift

techniques indicate that there is no real loss of generality.
Author (ESA)

N84-14850# Sheffield Univ. (England). Dept. of Control Engineering.
IDENTIFICATION OF NONLINEAR SYSTEMS
S. A. Billings Jul. 1983 26 p refs
(RR-232) Avail: NTIS HC A03/MF A01

Identification of nonlinear systems through functional series expansions, block oriented systems, and parameter estimation methods applied to differential or difference equation models is reviewed. The functional series methods can represent a very broad class of systems but involve an excessive amount of computation. The difficulty of incorporating a priori information, of interpreting the estimated kernels and of relating the kernels to the physical system are further disadvantages. The use of algorithms for block structured systems offers advantages compared to functional series methods, but most of the algorithms are based on correlation methods and this often dictates that the input is white gaussian. With techniques based on difference equation models the input/output map consists of an expansion of both past inputs and outputs, so the parameter set is reduced considerably and most of the restrictions are removed because of the flexibility of the parameter estimation routines. Author (ESA)

N84-14851# Technische Univ., Munich (West Germany). Inst. fuer Astronomische und Physikalische Geodaesie.
ESTABLISHING OBSERVATION EQUATIONS BY MEANS OF SERIES EXPANSION INTO EIGENFUNCTIONS
Manfred Schneider 1983 35 p refs Sponsored by Deutsche Forschungsgeimschaft
(TUM-MITT-163) Avail: NTIS HC A03/MF A01

Observation equations are established for measured quantities obtained in satellite geodesy. The exploitation of measurements densely distributed over relatively short arcs of satellite orbits is treated. A method which expands the solution of boundary value problems associated with second order differential equations for the observable quantities into series of eigenfunctions is proposed. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-14852# Florida State Univ., Tallahassee. Dept. of Statistics.
SOME NEW RESULTS ON GRUBBS' ESTIMATORS
Dennis A. Brindley (Bristol-Myers Corp.) and Ralph A. Bradley Jun. 1983 24 p Prepared in cooperation with Georgia Univ., Athens
(Contract N00014-80-C-0093)
(AD-A133922; FSU-STATISTICS-M648; TR-159-ONR; GU-154) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider a two-way classification with n rows and r columns and the usual model of analysis of variance except that the error components of the model may have heterogeneous variances by columns. When r=3, the joint distributions of the Sj and the Qj are given for the first time in closed form. Two tests proposed by Russell and Bradley are examined when r=3, one for variance homogeneity and the second for one possible disparate variance. A very simple distribution is found for the test statistic of the first test and its non-null distribution is derived also. The distribution of the second test statistic was known to be the central variance-ratio distribution in the null case and now its ration to a parameter of noncentrality is shown to have that same distribution in the non-null case. Extensive simulation studies show that the distribution of the test statistic may be approximated very well by a chi-square distribution. GRA

N84-14853# Educational Testing Service, Princeton, N. J.
AN INVESTIGATION OF METHODS FOR REDUCING SAMPLING ERROR IN CERTAIN IRT (ITEM RESPONSE THEORY) PROCEDURES
Marilyn S. Wingersky and Frederic M. Lord Aug. 1983 58 p
(Contract N00014-80-C-0402)
(AD-A133848; ETS-RR-83-28-ONR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The sampling errors of maximum likelihood estimates of item-response theory parameters are studied in the case where both people and item parameters are estimated simultaneously. A check on the validity of the standard error formulas is carried out. The effect of varying sample size, test length, and the shape of the ability distribution is investigated. Finally, the effect of anchor-test length on the standard error of item parameters is studied numerically for the situation, common in equating studies, where two groups of examinees each take a different test form together with the same anchor test. The results encourage the use of rectangular or bimodal ability distributions, also the use of very short anchor tests. Author (GRA)

N84-14854# California Univ., Berkeley. Operations Research Center.
A RANDOM WALK SUBJECT TO A RANDOMLY CHANGING ENVIRONMENT
Sheldon M. Ross Sep. 1983 17 p
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A133847; ORC-83-9) Avail: NTIS HC A02/MF A01 CSCL 12/2

A common model for the changes over time of the price (or sometimes the logarithm of the price) of a commodity is the random walk model. This is a Markov model which supposes that the change in price in any time period is a random variable, independent of the past, and having a given distribution F. In this note, we propose a generalized model in which the distribution of price change at any time depends upon the 'environmental state' at that time. That is, we suppose that if sub Sn and sub Yn represent the price and the environmental state at time in n then, given sub Yn = i, sub Sn+1 - Sn is a random variable with distribution Fi. We also suppose that the environmental state changes in a Markovian fashion. An application of this model to a stock option example is presented. Author (GRA)

N84-14855# Florida State Univ., Tallahassee.
RECURRENCE OF SYMMETRIC RANDOM WALKS Annual Report
S. W. Dharmadhikari (Univ. of Southern Illinois, Carbondale) and Kumar Joag-dev (Illinois Univ., Urbana) Jul. 1983 12 p
(Contract F49620-82-K-0007; AF Proj. 2304)
(AD-A133807; AFOSR-83-0769TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In another document Shepp has used certain definitions of unimodality and peakedness to show that if F and G are symmetric unimodal and F is less peaked than G, then the recurrence of F implies the recurrence of G. This paper extends Shepp's result to a wider class of symmetric and unimodal distributions. GRA

N84-14856# Arizona State Univ., Tempe. Group for Computer Studies of Strategies.
AN OVERVIEW OF THE QUASI-OPTIMIZER SYSTEM
Nicholas V. Findler Jul. 1983 19 p
(Grant AF-AFOSR-0340-82; AF Proj. 2304)
(AD-A133763; AFOSR-82-0464TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

An overview is given about the Quasi-Optimizes system which observes and measures the behavior of competitive strategies, infers their reasoning, and constructs a descriptive model of each. By evaluating the effectiveness of the components of there strategies and selecting the most satisfactory ones, it generates a normative model which is optimum in the statistical sense. Author

N84-14857# Florida State Univ., Tallahassee. Dept. of Statistics.
THE GAUSS-TCHEBYSHEV INEQUALITY FOR UNIMODAL DISTRIBUTIONS Annual Report

S. W. Dharmadhikari and Kumar Joag-dev Jun. 1983 16 p
(Contract F49620-82-K-0007; AF Proj. 2304)
(AD-A133760; FSU-STATISTICS-M659; TR-83-157-AFOSR; AFOSR-83-0770TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document describes The-Gauss-Tchebyshev Inequality for Unimodal Distributions. The determination of a value improves and extends a recent result of Vysochanskii and Petunin who have only considered the case r = 2 with a higher value for k2. The proof is also considerably simpler because it uses the convex structure of the class of unimodal distributions. GRA

N84-14858# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
ACCURATE EFFICIENT EVALUATION OF CUMULATIVE OR EXCEEDANCE PROBABILITY DISTRIBUTIONS DIRECTLY FROM CHARACTERISTIC FUNCTIONS
Albert H. Nuttall 1 Oct. 1983 57 p
(ZR0000101)
(AD-A133703; NUSC-TR-7023) Avail: NTIS HC A04/MF A01 CSCL 12/1

An accurate and efficient method of evaluating the entire cumulative or exceedance probability distribution, via one fast Fourier transform of the sampled characteristic function, is presented. The sampling rate applied to the characteristic function results in aliasing of the probability density function, while the limited extent of the sampling gives rise to a systematic disturbance in the calculated probability distribution. Both types of errors are easily recognizable and can be controlled by a trail and error procedure whereby the calculated distributions are plotted for observation and modification. The size of the fast Fourier transform determines the number of distribution values available, but has no effect upon the acccuracy of the result. Regardless of the number of characteristic function evaluations required for accurate results, the storage required is just that corresponding to the size of the fast Fourier transform. A program for the procedure is presented, and the inputs required of the user are indicated. Several representative examples and plots illustrate the utility of the approach. Author (GRA)

N84-14859# Florida State Univ., Tallahassee. Dept. of Statistics.
TOTAL POSITIVITY, A REVIEW
Jee Soo Kim and Frank Proschan Jul. 1983 18 p
(Contract F49620-82-K-0007; AF Proj. 2304)
(AD-A133691; FSU-STATISTICS-M663; AFOSR-83-159TR; AFOSR-83-0822TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is an invited entry for the Encyclopedia of Statistical Sciences published by John Wiley and Sons. The main objective is to review the concepts of total positivity, which play an important role in various domains of mathematics and statistics. This article describes the power and scope of total positivity, and samples the great variety of fields of its application. The theory of total positivity has been extensively applied in several domains of mathematics, statistics, economics, and mechanics. In statistics, totally positive functions are fundamental in permitting characterizations of best statistical procedures for decision problems. The scope and power of this concept extend to ascertaining optimal policy for inventory and system supply problems, to clarifying the structure of stochastic processes with continuous path functions, to evaluating the reliability of coherent systems, and to understanding notions of statistical dependency. GRA

N84-14860# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MULTIPLE RANKING PROCEDURE ADAPTED TO DISCRETE-EVENT SIMULATION Ph.D. Thesis - Texas Univ.
Robert Timothy Dickinson Dec. 1983 193 p
(AD-A133649; AFIT/CI/NR-83-47D) Avail: NTIS HC A09/MF A01 CSCL 12/1

The main objective of this research is to extend the multiple ranking procedure of Dudewicz and Dalal to the case of K normal covariance-stationary processes with unknown and nonidentical covariance structures. To implement this procedure, the author developed a computer program that can be called on the fly by an ongoing discrete-event simulation in order to select the best steady-state performance among K alternative policies. For each alternative policy, the proposed support package analyzes the simulation-generated output series to determine if the accumulated sample size is sufficient to meet the predetermined probability requirement (that is, the probability of yielding the correct selection). If the run length is not sufficient, the program determines that number of additional observations to be taken. Upon reaching an acceptable run length, the program reports the estimated mean response of the policy currently under consideration. The run for each alternative policy is executed independently and does not require any information from the runs for other policies. Author (GRA)

N84-14861# Texas A&M Univ., College Station. Dept. of Statistics.
INFORMATIVE QUANTILE FUNCTIONS AND IDENTIFICATION OF PROBABILITY DISTRIBUTION TYPES
Emanuel Parzen Aug. 1983 39 p
(Contract DAAG29-83-K-0051)
(AD-A132723; TR-A-26; ARO-20140.5-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A problem of great importance to statistical data analysts is quick identification of possible probability distributions for observed data, and classification of tail behavior of probability distributions. This paper discusses the informative quantile function IQ(u) = (Q(u) - Q(0.5)) divided by 2(Q(0.75) - Q(0.25)), and its use to identify probability models for observed data and to provide concepts of representative distributions which illustrate the different types of shapes and tail behavior that real distributions can have. This paper also discusses estimators of tail exponents; they can be used to identify outlying data values, and more centrally to identify possible distributions to fit to data. Author (GRA)

N84-14862# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE USE OF MARGINAL LIKELIHOOD IN TIME SERIES MODEL ESTIMATION
G. Tunnicliffe-Wilson Jul. 1983 42 p
(Contract DAAG29-80-C-0041)
(AD-A132828; MRC-TSR-2539) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with the estimation of regression models with errors which follow an Autoregressive Integrated Moving Average (ARIMA) process. The effect of the regression upon the ARIMA model parameter estimates is considered and marginal likelihood investigated as a means of overcoming some small sample bias. Examples illustrate the importance of this effect even in samples of moderate size. The consequences regarding inference for the regression coefficients are also discussed. GRA

N84-14863# Wisconsin Univ., Madison. Mathematics Research Center.
A RAPID CONVERGENCE METHOD FOR A SINGULAR PERTURBATION PROBLEM
Paul H. Rabinowitz Jul. 1983 26 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-10556)
(AD-A132837; MRC-TSR-2542) Avail: NTIS HC A03/MF A01 CSCL 12/1

The existence of spatially periodic solutions for a singular perturbation of elliptic type is established. A rapid convergence method is used to obtain the result. GRA

N84-14864# Wisconsin Univ., Madison. Mathematics Research Center.
MEASURES OF NONLINEARITY FOR SEGMENTED REGRESSION MODELS
Miriam L. Goldberg Aug. 1983 45 p Sponsored in part by the Ford Foundation and the New Jersey Dept. of Energy
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A132838; MRC-TSR-2549) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple physical model of residential energy consumption provides the framework for an exploration of segmented regression models fit by least squares. The energy model is a generalization of a linear, single change-point model such as that considered by Hinkley. Some simple geometric measures of nonlinearity and nondifferentiability are proposed. These measures are related to the construction of approximate confidence regions for the parameters of a general segmented model. In addition, the relation shown between these measures and those proposed by Bates and Watts may be useful in analyzing continuously differentiable models. Author (GRA)

N84-14865# Wisconsin Univ., Madison. Mathematics Research Center.
AN EFFICIENT GENERATOR OF UNIFORMLY DISTRIBUTED RANDOM DEVIATES BETWEEN ZERO AND ONE
Arne Thesen Aug. 1983 15 p
(Contract DAAG29-80-C-0041)
(AD-A132851; MRC-TSR-2554) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author shows that a uniformly distributed random deviate between zero and one can be constructed by combining two independent random variables: (1) a random exponent drawn from a geometric distribution, and, (2) a random mantissa drawn from a uniform distribution. Algorithms for generating these random variables are developed, and a Pascal procedure combining these into a computationally efficient random number generator for micro computers is presented. The resulting generator is computationally efficient as it uses no floating point arithmetic uses on the average only 3.5 random bytes to construct a four byte random deviate. Finally it is shown empirically that the generator has both an unusually long period and excellent statistical properties. Author (GRA)

N84-14866# Stanford Linear Accelerator Center, Calif.
MULTIPLICATION MODELS IN PROJECTION PURSUIT Ph.D. Thesis
David Harold Henry Aug. 1983 67 p refs
(Contract DE-AC03-76SF-00515)
(DE84-001142; SLAC-261) Avail: NTIS HC A04/MF A01

Multiplicative models for regression and categorical regression are explored. The construction of these models and their performance relative to additive models are examined. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-14867# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
LEAST SQUARE APPROXIMATION BY LINEAR COMBINATIONS OF MULTIPOLES
Willi Freeden Hanscom AFB, Mass. AFGL Apr. 1983 92 p
(Contract F19628-82-K-0017; AF Proj. 7600)
(AD-A134069; OSU/DGSS-344; SR-3; AFGL-TR-83-0117) Avail: NTIS HC A05/MF A01 CSCL 12/1

The purpose of the paper is to transcribe the standard procedure of expanding an external gravitational potential by trial functions (e.g., mass points, multipoles, spherical harmonics) from the classical spherical case to non-spherical models. The external gravitational potential of the Earth is shown to be expandable into a series being convergent outside and on any closed surface completely surrounding the Earth's surface in the outer space. In addition, for each compact subset of the outer space with positive distance to the Earth's surface, the convergence is uniform. A numerical method of computing the external gravitational potential by truncated series expansions concludes the paper. Author (GRA)

N84-14868# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SYMMETRIC SET THEORY, A GENERAL THEORY OF ISOMORPHISM, ABSTRACTION, AND REPRESENTATION
David Allen McAllester, T. Poggio, and B. L. Rosser Aug. 1983 31 p
(Contract N00014-80-C-0505)
(AD-A133630; AI-M-710) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is possible to represent a finite set of points (atoms) by a finite sequence of points. However, a finite set of points has no distinguished member and therefore it is impossible to define a function which takes a finite set of points and returns a first point in that set. Thus, it is impossible to represent a finite sequence of points by a finite set of points. The theory of symmetric sets provides a framework in which this observation about sets and sequences can be proven. The theory of symmetric sets is similar to classical (Zermello-Fraenkel) set theory with the exception that the universe of symmetric sets includes points (ur-elements). Points provide a basis for general notions of isomorphism and symmetry. The general notions of isomorphism and symmetry in turn provide a basis for natural, simple, and universal definitions of abstractness, essential properties and functions, canonicality, and representations. It is expected that these notions will play an important role in the theory of data structures and in the construction of general techniques for reasoning about data structures. Author (GRA)

N84-14869# Argonne National Lab., Ill. Mathematics and Computer Science Div.
FULL- AND HALF-RANGE THEORY OF INDEFINITE STURM-LIOUVILLE PROBLEMS
Hans G. Kaper, Man Kam Kwong (Northern Illinois Univ.), C. G. Lekkerkerker (Amsterdam Univ.), and A. Zettl (Northern Illinois Univ.) Sep. 1983 53 p refs
(Contract W-31-109-eng-38)
(DE84-001672; ANL-83-76) Avail: NTIS HC A04/MF A01

Eigenvalue problems of the form Au = lambda Tu, where A is a selfadjoint positive differential operator and T a selfadjoint indefinite multiplicative operator on a Hilbert space H are considered. Three particular cases are discussed in detail. In the first case, A is positive definite and T is unitary; in the second case, A is positive definite and T is bounded, but T(-1) is unbounded; in the third case, A is positive, dim ker(A) = 1, and T is bounded, but T(-1) is unbounded. Emphasis is on the full-range and half-range expansion properties of the eigenfunctions. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-14870# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A MATHEMATICAL INVESTIGATION OF THE INDUCTION ACCELERATION OF CONDUCTORS
A. N. Andreyev and V. N. Bondaletov 19 Sep. 1983 6 p Transl. into ENGLISH from Vysokovolt Impuls Tekhn. (USSR), no. 1, 1972 p 20-21
(AD-A133786; FTD-ID(RS)T-0948-83) Avail: NTIS HC A02/MF A01 CSCL 20/3

The establishment of the optimum conditions for the induction acceleration of conductors through the use of mathematical models is briefly discussed. The most limiting factors in achieving high efficiencies are the active resistances of the inductor and the accelerated body. The use of superconductors and coil design factors are addressed. M.G.

N84-14871# Rochester Univ., N. Y. Dept. of Chemistry.
LOCALIZED MAGNETIZATION ARISING FROM SPIN-DEPENDENT IMPURITY POTENTIALS IN THE WOLFF MODEL
K. C. Liu, Kai-Shue Lam, and Thomas F. George Oct. 1983 33 p
(Contract N00014-80-C-0472)
(AD-A133652; UROCHESTER/DC/83/TR-39) Avail: NTIS HC A03/MF A01 CSCL 20/3

The Wolff model for localized magnetic moments in dilute alloys is extended to include spin-dependent impurity potentials. Two virtual levels emerge, corresponding to different spin states of the conduction electrons. As a result of this removal of degeneracy, there always exists a more favorable spin polarization for the spin state with the more attractive impurity potential, even in certain circumstances where the original Wolff model yields no magnetization. The results are obtained graphically for various situations. The physical pictures entailed can also be interpreted in terms of the Anderson model. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.
For noise pollution see *45 Environment Pollution.*

N84-14872 Polytechnic Inst. of New York, Brooklyn.
ACOUSTIC RADIATION FROM SUBMERGED STRUCTURES AT CHARACTERISTIC FREQUENCIES Ph.D. Thesis
Christopher Mark Piaszczyk 1983 85 p
Avail: Univ. Microfilms Order No. DA8316777

The application of the boundary integral methods to the problem of acoustic radiation encounters serious difficulties at the characteristic frequencies of the associated interior Dirichlet problem. Specifically, in the surface Helmholtz formulation, using the Green's surface integral formula in conjunction with the Neumann type of boundary conditions, the solution exists but is not unique. An iterative numerical overdetermination scheme is developed. This method is applied to the cylindrical transducer problem and proves to yield good results at characteristic frequencies. Next, using finite element discretization of the elastic structure, a problem of structure - fluid interaction is considered. Dissert. Abstr.

N84-14873* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPARATUS AND METHOD FOR JET NOISE SUPPRESSION Patent
Lucio Maestrello, inventor (to NASA) Issued 16 Aug. 1983 9 p
Filed 27 Feb. 1981 Supersedes N82-20465 (20 - 11, p 1504)
Continuation of abandoned US Patent Appl. SN-753971, filed 23 Dec. 1976
(NASA-Case-LAR-11903-2; US-Patent-4,398,667; US-Patent-Appl-SN-238791; US-Patent-Appl-SN-753971; US-Patent-Class-239-265.17) Avail: US Patent and Trademark Office CSCL 20A

A method and apparatus for jet noise suppression through control of the static pressure of the jet and control of the rate of entrainment of ambient fluid into the jet downstream of the exhaust nozzle is disclosed. The momentum flux over an extended region of the jet is regulated, affecting Reynolds stresses in the jet and the spreading angle of the jet. Static pressure is controlled through a long hollow, porous nozzle plug centerbody which may be selectively vented to ambient conditions, connected to a vacuum source, or supplied with fluids of various densities for injection into the stream. Sound in the jet may be channeled along the nozzle plug centerbody by injecting coolant such as a cryogenic fluid throughout the center-body into the jet.
Official Gazette of the U.S. Patent and Trademark Office

N84-14874*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A POSSIBLE EXPLANATION FOR THE PRESENT DIFFERENCE BETWEEN LINEAR NOISE THEORY AND EXPERIMENTAL DATA FOR SUPERSONIC HELICAL TIP SPEED PROPELLERS
James H. Dittmar Nov. 1983 18 p refs
(NASA-TM-83467; E-1781; NAS 1.15:83467) Avail: NTIS HC A02/MF A01 CSCL 20F

High speed turboprops are attractive candidates for future aircraft because of their high propulsive efficiency. However, the noise of their propellers may create a cabin environment problem for the aircraft powered by these propellers. The noise of some propeller models was measured, and predictions of the noise using a method based on the Ffowcs Williams-Hawkins equation were made. The predictions and data agree well at lower helical tip Mach numbers but deviate above Mach 1.0. Some possible reasons why the theory does not predict the data and focuses on improvement of the aerodynamic inputs as the most likely remedy are investigated. In particular, it is proposed that an increase in the drag and a decrease in the lift near the tip of the blade where the majority of the noise is generated, is warranted in the input to the theory. Author

N84-14875# Naval Postgraduate School, Monterey, Calif.
A HORIZONTAL RANGE VERSUS DEPTH SOLUTION OF SOUND SOURCE POSITION UNDER GENERAL SOUND VELOCITY CONDITIONS USING THE LLOYD'S MIRROR INTERFERENCE PATTERN M.S. Thesis
Richard Franklin Hudson Sep. 1983 68 p
(AD-A134097) Avail: NTIS HC A04/MF A01 CSCL 12/1

An algorithm is developed which enables the computation of horizontal range and/or depth from a submerged sound source, using ray acoustics and the Lloyd's mirror interference effect. The solution is based on Snell's law and involves integrating multipath sound rays to find the difference in length between the direct and surface reflected sound paths from the source to the receiver. This difference in path length is directly related to the observed Lloyd's mirror interference pattern. No assumptions as to the mathematical characteristics of the sound velocity profile (SVP) are made nor are far field approximations used. The solution is as accurate as the SVP data input to the problem. A general computer flow chart and basic language program are provided to allow local commands the capability of premission planning based on specific operating area environmental information. GRA

N84-14876# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
SOUND PROPAGATION THROUGH A MODERATE COASTAL UPWELLING: COMPARISON OF MODELING PREDICTION WITH EXPERIMENTAL DATA
J. T. Malay, P. D. Scully-Power, D. G. Browning, and C. N. K. Mooers (Naval Postgraduate School) 22 Aug. 1983 20 p
Presented at the 103rd Meeting of the Acoustical Society of America, 26-30 Apr. 1982
(AD-A133782; NUSC-TD-6737) Avail: NTIS HC A02/MF A01 CSCL 20/1

In a previous paper, modeling predictions were made for the effect of a coastal upwelling on sound propagation. To verify these results, a sound propagation experiment was conducted across a moderately developed upwelling located at the Sur Canyon off the coast of California. A 1-kHz projector was towed through a sonobuoy field which spanned the upwelling region. A supporting oceanographic survey was made to obtain environmental data input for multi-profile modeling predictions. The relative importance of oceanographic and topographic changes on sound propagation were determined. A follow-on experiment in a fully developed upwelling is planned. GRA

N84-14877# United Technologies Corp., East Hartford, Conn.
RESEARCH AND DEVELOPMENT OF SUBSURFACE ACOUSTIC WAVE DEVICE CONFIGURATIONS FOR SENSOR APPLICATIONS Final Report, 15 Jul. 1982 - 12 Sep. 1983
Donald E. Cullen, Gerald Meltz, and Thomas W. Grudkowski Sep. 1983 76 p
(Contract F49620-82-C-0074; AF Proj. 2305)

(AD-A133659; UTRC-R83-926157; AFOSR-83-0825TR) Avail: NTIS HC A05/MF A01 CSCL 20/1

Subsurface acoustic wave modes that are sensitive to substrate strain but insensitive to temperature and surface fluid loading were sought for sensor applications. The properties of Stoneley-like interface waves in the layered structure SiO2/LiNbO3 were examined. A horizontal-shear surface wave in the same material configuration was found to be insensitive to surface fluids and was further studied for sensor applications. Zero first order temperature coefficients were found for these modes by varying the SiO2 film thickness. Surface skimming bulk waves in quartz were also examined and found to possess the most attractive properties for continued work in acoustic wave sensor development. Author (GRA)

N84-14878 Houston Univ., Tex.
THE EFFECTS OF EXTERNAL AND SELF EXCITATIONS ON AXISYMMETRIC JET TURBULENCE AND NOISE Ph.D. Thesis
M. Abbas Zaqir Hasan 1983 232 p
Avail: Univ. Microfilms Order No. DA8317388

The effects of external- and self-excitations on axisymmetric jet turbulence and noise as well as the self-sustained oscillation phenomena (SSOP) were experimentally studied. A high subsonic Mach number (Maximum Mach number = 0.7) air jet was used for most investigations while the SSOP study has involved ring tone, hole tone and 'whistler nozzle' excitations in low velocity air jets. Based on the data ring and hole tones and the 'whistler nozzle', it is shown that such tones are strongly dependent on the initial condition. For the initially turbulent jet, the tone occurs only when there is a resonator in the system. The data collapse when nondimensonalized by the exit momentum thickness and the distance between separation and impingment points rather than the diameter as suggested previously. Dissert. Abstr.

N84-14186# Academy of Sciences (USSR), Moscow. Inst. of Earth Physics.
STRONG ACOUSTIC WAVE ACTION
M. B. Gokhberg *In* ESA Active Expts. in Space Jul. 1983 p 99-110 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-14879# Materials Research Labs., Melbourne (Australia).
RESULTS FROM AN EXPERIMENTAL RAILGUN SYSTEM: ERGS-1A
Y. C. Thio (Westinghouse Research and Development Center, Pittsburgh), G. A. Clark, and A. J. Bedford Mar. 1983 28 p refs
(MRL-R-875; AR-003-285) Avail: NTIS HC A03/MF A01

One phase of the Materials Research Laboratories (MRL) Experimental Rail-gun System (ERGS-1) program is for experimentation in the energy range 50 to 500 kJ. The first, and highly successful, ERGS-1 experiment was conducted in September 1981 using a barrel segment 200 mm in length. Comparison of experimental results with the theory developed by Thio yielded good agreement, particularly the values for capacitor voltage, current through the rails, plasma voltage and muzzle velocity of the projectile. Author

N84-14880# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
AN INVESTIGATION OF CASCADE ENERGY DENSITY EFFECTS USING CLASSICAL TRAJECTORY SIMULATIONS OF SPUTTERING BY MOLECULAR IONS M.S. Thesis
William A. Mason Jun. 1983 92 p
(AD-A132539) Avail: NTIS HC A05/MF A01 CSCL 07/4

The NPS computer simulation model was modified to study sputtering by molecular ions. The simulations were performed on a Cu(111) surface for normally incident 02+ ions at 0.5, 1.25, 2.5, and 5.0 kev/ion. The molecule's angular orientation was both set at specific values and randomly determined. The normalized energy distribution of sputtered atoms for two energy ranges, 0-20 and 0-3 ev/sputtered atom, and the sputtering yeild rations were investigated. The 0-20 ev/sputtered atom energy distributions show distinct peaks at 1.8 ev which are insensitive to incident energy, energy density, and molecular orientation. Simulations indicate that there may be fine structure in the 0-3 ev/sputtered atom range with a cascade interaction unique to molecular sputtering. For a number of molecular orientations which produce very different cascade overlaps, the sputtering yield ratios do not correlate with the degree of overlap. The energy density of a cascade is not an accurate predictor of the sputtering yield ratio. GRA

N84-14881# Wisconsin Univ., Madison. Dept. of Physics.
COLLISIONAL EXCITATION AND RADIATION OF ATOMS AND MOLECULES Final Technical Report, 1 Jul. 1978 - 30 Jun. 1983
Chun C. Lin 19 Aug. 1983 5 p
(Grant AF-AFOSR-3649-78; AF Proj. 2301)
(AD-A134093; AFOSR-83-0802TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The general objectives of this research project are to study collisional excitation of atoms and molecules and the radiation emitted by these excited atoms and molecules. Our major efforts include electron excitation of the sodium and xenon atoms, excitation of electronic states of nitrogen molecules, formation of excited nitrogen atoms by electron-impact dissociation of nitrogen molecules, measurement of electron excitation cross sections of metastable levels of neon atoms, excitation of atoms by H+, H0, H- impact. GRA

N84-14882# Berkeley Research Associates, Inc., Calif.
RESEARCH ON INTENSE ELECTRON BEAMS AND APPLICATIONS Final Report, Jun. 1981 - Jun. 1983
D. Chernin, P. Sprangle, A. Mondelli, and C. Roberson Aug. 1983 183 p
(Contract N00014-81-C-2371)
(AD-A134068; PD-BRA-83-302R) Avail: NTIS HC A09/MF A01 CSCL 20/7

This report covers the period June 1981 to June 1983, during which time investigations were conducted into several major topics concerning the behavior of an intense (multi-kiloampere) electron beam in the modified betatron electron accelerator. The modified betatron has been selected for experimental evaluation as a high-current electron accelerator. Theoretical support has been directed at identifying those phenomena which will most directly affect accelerator performance. To this end, research has been carried out in the following areas: (1) Transverse linear beam dynamics in time varying, azimuthally symmetric fields, (2) Effects of grad B theta induced drifts, (3) Orbital resonance effects due to small field errors, (4) Nonlinear effects, especially those due to non-constant betatron field index, (5) Collective effects, especially the negative mass instability, and (6) Strongly focused systems. GRA

N84-14883# International Business Machines Corp., San Jose, Calif.
THEORY OF ELECTRONIC, ATOMIC AND MOLECULAR COLLISIONS Final Report, Jun. 1979 - Jul. 1983
R. K. Nesbet Sep. 1983 54 p
(Contract N00014-79-C-0406)
(AD-A134025) Avail: NTIS HC A04/MF A01 CSCL 07/4

Research under this contract covered theoretical studies of atom-molecule reactive collisions and of electron-molecule scattering. In both cases the principal emphasis was on development of theoretical methods designed for computational studies useful in interpreting or refining experimental results. GRA

N84-14884# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THEORETICAL STUDIES IN MOLECULAR FRAGMENTATION: PROCESSES, ENERGETICS AND DIAGNOSTICS Annual Progress

Report, 1 Sep. 1982 - 31 Aug. 1983
Kate P. Kirby 22 Sep. 1983 5 p
(Contract N00014-82-K-0536)
(AD-A134006; APR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

This research is directed toward providing diagnostic tools with which to identify and quantify the presence of fragment species and their energy states resulting from molecular destruction processes. Ab initio methods were used to calculate potential energy curves and transition moments for excited Sigma + and 1 Pi states of CO. Vibration rotation transition probabilities for vibrationally hot CN have been obtained. Work is commencing on the excited electronic states of NH. GRA

N84-14885# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
MODELLING PARTICLE - PARTICLE INTERACTION AT THE MICRO SCALE Final Report, 1 Nov. 1977 - 30 Sep. 1981
J. L. Swedlow 15 Mar. 1983 117 p
(Grant AF-AFOSR-3533-78; AF Proj. 2307)
(AD-A133969; SM83-2A; AFOSR-83-0868TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

In high-strength alloys, microstructure can influence toughness in a manner not yet fully quantified. Computational mechanics offers a tool whereby the events leading to fracture may be simulated, but the success of such an enterprise depends heavily upon the quality of the model employed. This report outlines a sequence of events thought to precede ductile fracture and presents a finite element model designed to capture the main events. The model is considered to be an improvement over an earlier one, and data are presented to support this conclusion. Work of this type requires a fine degree of resolution which normally will entail very large, detailed finite element maps. Such map sizes could easily exceed the capacity of research computers, and a substructuring technique is essential to pursue research of this sort. Such a technique has been developed for use without modification to an existing code, i.e., it may be implemented on a standard finite element program directly. Author (GRA)

N84-14886# Yale Univ., New Haven, Conn. Dept of Chemical Engineering.
COLLISIONAL ENERGY EXCHANGE IN POLYATOMIC MOLECULES Final Technical Report, 1 Jan. 1980 - 31 Dec. 1982
S. B. Ryali and J. B. Fenn 21 Aug. 1983 15 p
(Contract F49620-80-C-0026; AF Proj. 2303)
(AD-A133942; AFOSR-83-0804TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Fourier Transform infrared Spectrometry (FTIS) has been used to study several kinds of gas-gas and gas-surface collision processes brought about with and in supersonic free jets in vacuo. Following are some key results: (1) Terminal distributions of rotational energy in free jets of CO and CO2 show a non-Boltzmann distribution that can be characterized by a two-temperature model and explained in terms of competition between rotation-rotation and rotation-translation transfers. (2) Spectra of CO2 molecules excited by collisions with N2 molecules indicated similar two-temperature distributions, possibly due to secondary collisions between excited CO2 and N2. (3) The accommodations of vibrational and rotational energy during collisions between CO, CO2 and NO molecules and hot platinum surfaces has been determined over a range of surface temperatures. (4) Excess internal energies have been determined in nascent CO and CO2 molecules formed respectively by catalytic oxidation of C and CO on a platinum surface. An energy balance indicates that about 1/3 of the available reaction energy is absorbed by the surface, the remainder going mostly into vibrational modes of product molecules. GRA

N84-14887# JAYCOR, Alexandria, Va.
THERMIONIC CATHODE, MITL (MAGNETICALLY INSULATED TRANSMISSION LINE) AND AUXILIARY COILS SYSTEMS INVESTIGATIONS FOR THE MODIFIED BETATRON Final Report, 3 Jun. 1981 - 31 Dec. 1982
Dean E. Pershing and Steven P. Slinker 29 Jul. 1983 53 p
(Contract N00014-81-C-2321)
(AD-A133757; AD-E001556; JAYCOR-J206-83-008/6214) Avail: NTIS HC A04/MF A01 CSCL 20/7

A major objective is the production of high energy, high quality multi kiloampere electron beams with compact sources. The effort to date has concentrated on the Modified Betatron Accelerator (MBA), which, with the addition of a strong toroidal magnetic field to the conventional betatron field, can confine and accelerate electron beams in the kiloampere range. Several issues, particularly relevant to injection into the MBA are discussed in this report. GRA

N84-14888# Colorado State Univ., Fort Collins. Dept. of Chemistry.
MOLECULAR JET STUDY OF ANILINE-HELIUM VAN DER WAALS MOLECULES AND ANILINE RADIATIONLESS RELAXATION IN THE 1-B SUB 2 EXCITED ELECTRONIC STATE
E. R. Bernstein, K. Law, and Mark Schauer 16 Sep. 1983 67 p
Submitted for publication
(Contract N00014-79-C-0647)
(AD-A132726; TR-11) Avail: NTIS HC A04/MF A01 CSCL 07/3

Fluorescence excitation (FE), dispersed emission (DE), and time of flight mass spectroscopy (TOFMS) techniques are employed to study the van der Waals molecules formed in a molecular supersonic jet of aniline and helium (AnHe sub x). It is found that AnHe1, AnHe2, and AnHe3 have absorption bands that fall under all the An(nu') vibronic features in the 1B2 electronic state of An. The features to the high energy side of the An vibronic transitions are tentatively associated with vibrations of the above van der Waals molecules. The DE from both An and AnHe sub x can be characterized as either relaxed or unrelaxed depending on whether or not the aniline vibronic state emitting is the same as or different from that which was pumped. All relaxed An emission can be associated with vibrational predissociation of the AnHe sub x species. All unrelaxed emission from AnHe sub x (nu' +v), with nu' = An sub x mode and v = vdW bond mode, can be associated with delta v = 0 transitions from AnHe sub x. A number of other relaxation mechanisms are presented and discussed including collisional ones. Some time estimates for the major processes can be discussed. GRA

N84-14889# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
STIMULATED CERENKOV RADIATION BEAM MONITOR M.S. Thesis
Kenneth Scott Pugh Jun. 1983 67 p
(AD-A132817) Avail: NTIS HC A04/MF A01 CSCL 20/8

It was suggested that many important characteristics of a bunched relativistic electron beam might be determined by monitoring the Cerenkov radiation produced as the beam passes through or very close to a dielectric medium. This report describes an effort to produce stimulated Cerenkov radiation (SCR) in a dielectric slab using a bunched beam of 100 MEV electrons from a linear accelerator. Although the method used displayed only limited success, the results were consistent with previous work and further confirmed the basic ideas regarding SCR production. In conjunction with the experimental work performed, an analysis was conducted concerning the manner in which various electron charge distributions which might be used to describe how the electron bunches affect the Cerenkov radiation emitted by the beam. In principle, the results imply that proper monitoring of the Cerenkov radiation from a beam should allow one to deduce the total bunch charge and charge distribution. GRA

N84-14890# Air Force Academy, Colo. Directorate of Chemical Sciences.
WHEN IS AN INTERNAL ROTATION A VIBRATION? Interim Report, Jun. - Aug. 1983
Christopher Lisanti, Larry P. Davis, and Mavis Compagno Aug. 1983 20 p
(AF Proj. 2303)

(AD-A132974; FJSRL-TR-83-0008) Avail: NTIS HC A02/MF A01 CSCL 20/13

Calculation of entropies for molecules having internal rotations are in error if these rotations are treated as vibrations. Using MNDO-calculated geometries, entropies of a set of molecules were calculated assuming all internal motions were vibrations. Errors were determined for these molecules, with particular attention paid to the ones containing internal rotations. Based on the total internal partition functions calculated in this manner compared to total internal partition functions calculated by assuming a free rotor for the internal rotation we developed a criterion for determining when the free rotor correction needs to be made to the entropy values. The correction greatly improves the calculated entropy for molecules with internal rotation. GRA

N84-14891# Naval Research Lab., Washington, D. C.

THE EFFECT OF FIELD INDEX FLUCTUATIONS ON THE DYNAMICS OF A HIGH CURRENT ELECTRON RING IN A MODIFIED BETATRON ACCELERATOR

C. Agritellis, S. J. Marsh, and C. A. Kapetanakos 14 Sep. 1983 31 p
(RR01109)
(AD-A133089; NRL-MR-5141) Avail: NTIS HC A03/MF A01 CSCL 09/2

Analytical and computer simulation results are reported on the effect of the external field index fluctuations on the dynamics of a high current electron ring in a modified betatron. These non-linear studies clearly demonstrate that the external field index fluctuations are, in general, harmless to the high current ring. In addition, it was found that a small (1%) temperature spread parallel to the direction of propagation excites oscillations in the rms emittance, but the amplitude of these oscillations is substantially lower than in a conventional betatron. Author (GRA)

N84-14892# Wisconsin Univ., Madison. Dept. of Chemistry.

ROTATIONAL ENERGY TRANSFER IN HIGHLY VIBRATIONALLY EXCITED HYDROGEN FLUORIDE AND DEUTERIUM FLUORIDE Summary Report, Jun. 1982 - May 1983

F. Fleming Crim 16 Mar. 1983 7 p
(Contract N00014-79-C-0415)
(AD-A133102) Avail: NTIS HC A02/MF A01 CSCL 07/4

Overtone vibration-laser double resonance measurements have provided new data on vibrational and rotational relaxation in HF($v = 2$). These experiments determine the magnitudes of the total vibrational relaxation rate constants for HF($v = 1$ and 2) as well as their temperature dependences. Rotational relaxation data come from these measurements as well. The temporal evolution of individual rotational states observed in the double resonance studies provides level-to-level energy transfer rate constants when analyzed using an iterative fitting scheme which incorporates scaling relations among the rate constants. GRA

N84-14893# Sandia Labs., Albuquerque, N. Mex.

THEORETICAL TREATMENT OF THE CURRENT NEUTRALIZATION OF HIGH INTENSITY LIGHT ION BEAMS IN ARGON

J. A. Swegle, S. A. Slutz, and D. J. Johnson 1983 9 p refs Presented at 5th Intern. Conf. on High Power Particle Beams, San Francisco, 12 Sep. 1983
(Contract DE-AC04-76DP-00789)
(DE84-000118; SAND-83-0629C; CONF-830911-13) Avail: NTIS HC A02/MF A01

The current neutralization of intense light ion beams propagating through low pressure argon gas in the drift region of the applied-B radial ion diode was modeled. The current neutralization process results were described in a set of equations, each having the form of a system with an intrinsic magnetic decay time constant and driven by the time derivative of the beam current. The time constant is proportional to the gas electrical conductivity, for which a time dependent model is employed. Comparing the calculations to the experiments, the computations duplicate the qualitative behavior of the system in portions of the drift region free of applied magnetic fields; however, in regions with strong applied fields, the degree of current neutralization found experimentally was underpredicted. The addition of carbon ions to the beam model improves the neutralization. DOE

N84-14894# Stanford Linear Accelerator Center, Calif.

NEW PARTICLES AND INTERACTIONS

John Ellis Jul. 1983 28 p refs Presented at the 14th Intern. Symp. on Multiparticle Dyn., Lake Tahoe, Nev., 22 Jun. 1983
(Contract DE-AC03-76SF-00515)
(DE84-001444; SU-SLAC-PUB-3168; CONF-830689-8) Avail: NTIS HC A03/MF A01

Multiparticle dynamics serves as a valuable means of advancing our knowledge down the more fundamental line of elementary particle physics. The point of view is taken that the Standard SU(3) x SU(2) x U(1) Model is well established, and is now ripe to be used as a tool for analyzing physics beyond the Standard Model. The tool kit should include reliable and efficient ways of distinguishing gluon jets from quark jets, and of discriminating between t,b,c and light quark jets. The most topical physics issues arising from the recent confirmation of the Standard Model are reviewed. These include the need for dynamical principles which go beyond the gauge principle, and in particular a satisfactory mechanism for gauge symmetry breaking. Some of the ideas proposed for solving these problems, such as technicolor and supersymmetry (SUSY), are reviewed, together with some of the experimental tests that are performed. SUSY is examined in detail, and some ways of looking for particles in $e(+)e(-)$ and anti pp collisions are discussed. DOE

N84-14895# Washington Univ., Seattle. Dept. of Physics.

SOLITON BAG: DYNAMICS AND THE QUARK PLASMA

L. Wilets, R. Goldflam, J. Achtzehnter, M. Bickeboller, J. L. Dethier, E. M. Henley, G. Lubeck, J. Rehr, and A. Schuh Jun. 1983 6 p refs Presented at the 6th Intern. Balaton Topical Conf. on High Energy Nucl. Phys., Balantonfured, Hungary, 6 Jun. 1983
(Contract DE-AC06-81ER-40048)
(DE84-001103; DOE/ER-40048/16; CONF-830674-5) Avail: NTIS HC A02/MF A01

The soliton model of interacting quarks and gluons, introduced by Friedberg and Lee, effects both spatial and color confinement of the constituents. The properties of the static bag were reported previously. Because the model is described by a complete Hamiltonian, the dynamics of the system is followed unambiguously. For this purpose, theoretical methods which have proved effective in the study of nuclear collective motion, heavy ion collisions, and fission were employed. Three levels of approximation to bag dynamics are considered. First, the normal modes of excitation of the quarks and of the soliton field are considered. At the second level of approximation, the interaction between quark and soliton modes is calculated for small amplitude oscillations. At the third level, large scale deformations such as bag collisions, e.g., N-N scattering is studied. DOE

N84-14896# Los Alamos Scientific Lab., N. Mex.

WHITE HORSE PROGRAM REVIEW, FY 82

H. O. Dogliani, comp. and J. A. Farrell, comp. Sep. 1983 141 p refs
(Contract W-7405-eng-36)
(DE84-002290; LA-9835-PR) Avail: NTIS HC A07/MF A01

A review of the major achievements in the White Horse Program is provided. Most efforts in FY 82 involved completion of the 2-MeV accelerator test stand culminating in installation of the Radio Frequency Quadrupoles, on-line in September 1982. Numerous experiments were conducted, resulting in a significant understanding of beam dynamics and RF structures. DOE

N84-14897# Oak Ridge National Lab., Tenn. Atomic Theory Group.

INDIRECT PROCESSES IN ELECTRON-ION SCATTERING

C. Bottcher, D. C. Griffin, M. S. Pindzola, and R. A. Phaneuf Oct. 1983 29 p
(Contract W-7405-eng-26)
(DE84-002381; ORNL/TM-8868) Avail: NTIS HC A03/MF A01

The current status of theoretical calculations of indirect processes in electron-ion scattering was reviewed. Processes of particular interest in astrophysical and fusion plasmas were emphasized. Topics discussed include atomic structure effects, electron-impact ionization, and dielectronic recombination. DOE

N84-14898# National Bureau of Standards, Washington, D.C. National Measurement Lab.
PHOTONUCLEAR DATA INDEX, 1973-1981, SUPPLEMENT 2 TO NBS (NATIONAL BUREAU OF STANDARDS) SPECIAL PUBLICATION 380
E. G. Fuller and Henry Gerstenberg Aug. 1983 155 p
(PB83-251363; NBSIR-82-2543-1) Avail: NTIS HC A08/MF A01
CSCL 20H

This index, a supplement to NBS Special Publication 380, Photonuclear Reaction Data, 1973, primarily covers data published in the period from January 1973 through December 1981. It supersedes the first supplement to Special Publication 380 issued in August 1978. Organized by element and isotope, each entry in the index is for a specific reaction reported in a given reference. Information is given on the type of measurement, excitation energies studied, source type and energies, detector type and angular ranges covered in the measurement. Also included is an index to the more than 1200 data sets currently available in the Photonuclear Data Group's digital data library. GRA

N84-14195*# Stanford Univ., Palo Alto, Calif. Space, Telecommunications and Radioscience Lab.
ELECTRON BEAM EXPERIMENTS ABOARD THE SPACE SHUTTLE
P. M. Banks, P. R. Williamson, W. J. Raitt (Utah State Univ., Logan), S. D. Shawhan (Iowa Univ., Iowa City), and G. Murphy (Iowa Univ., Iowa City) *In* ESA Active Expts. in Space Jul. 1983 p 171-175 refs (For primary document see N84-14172 05-12)
(Contracts NAS5-24455; NAS8-32807; Grant NAGW-235)
Avail: NTIS HC A17/MF A01 CSCL 20H

N84-14220# European Space Research and Technology Center, Noordwijk (Netherlands). Space Sciences Dept.
THE EXPERIMENT PHENOMENA INDUCED BY CHARGED PARTICLE BEAMS (PICPAB) ON BOARD SPACELAB 1
C. Beghin (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), J. L. Michau (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), M. Pirre (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), L. Pomathiod (Laboratoire de Physique et de Chimie de l'Environnement, Orleans, France), J. J. Berthelier (Centre de Recherche en Physique de l'Environnement Terrestre et Planetaire, Saint-Maur, France), J. P. Lebreton, and B. N. Maehlum (Norwegian Defence Research Establishment, Kjeller) *In* ESA Active Expt. in Space Jul. 1983 p 349-355 refs Sponsored by CNES, ESA and Norwegian Defence Research Establishment (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14221# Institute of Space and Astronautical Science, Tokyo (Japan).
SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC). SCIENCE PROBLEMS OF SEPAC/SPACELAB 1 MISSION
Tatsuzo Obayashi *In* ESA Active Expts. in Space Jul. 1983 p 357-359 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-14899# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
EXPERIMENTAL TECHNIQUE FOR HANDLING AND ANALYSIS OF PARTICLES COLLECTED AFTER NUCLEAR EXPLOSIONS
Lars-Henrik Andersson and Lars-Eric Carlsson (Lund Univ., Sweden) 4 Aug. 1983 12 p refs In SWEDISH; ENGLISH summary
(FOA-C-20503-A1; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

Methods for handling radioactive particles are described. Particles with diameters 2 to 10 microns were fixed in a thin collodion layer on a glass plate and mounted on carbon or plastic foils prior to X-ray analysis in electron and proton microprobes. Calcium fluoride particles containing low concentrations of uranium tetrafluoride were used. A uranium level of 0.1% is demonstrated in a particle of 5 microns. A plutonium concentration of < 0.2% is detected in a particle consisting of Al, Si, K, Ca, Zn, Sr and Ba. Author (ESA)

74 OPTICS

Includes light phenomena.

N84-14900 Texas Univ., Austin.
LIGHT DEFLECTION AND TIME DELAY IN THE SOLAR GRAVITATIONAL FIELD Ph.D. Thesis
Gary William Richter 1983 163 p
Avail: Univ. Microfilms Order No. DA8319671

The second nonvanishing order of contribution to light deflection and time delay in the solar gravitational field is studied for a realistic solar model and for a wide range of metric theories of gravity. It is shown that the second-order effects arise at order (GM/c squared R) squared is idential with epsilon(4). To calculate these effects, every component of the solar metric must be known to order epsilon(4). The parametrized post-Newtonian (PPN) metric provides most of those components. However, some extension of the PPN metric is required. This extension leads to the parametrized post-linear (PPL) metric, which is used in all calculations. To study light deflection to order epsilon(4) requires that the orbits of scattered photons be known to that order. These orbits are solved for, first in the equatorial plane and then in general, and are used to determine the deflection as measured by an observer at rest with respect to the Sun. In the equatorial plane there is only a radial component to this deflection.
Dissert. Abstr.

N84-14901 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
MODULAR OPTOELECTRONIC MULTISPECTRAL SCANNER (MOMS). DIGITAL IMAGE STORAGE [MODULARER OPTOELEKTRONISCHER MULTISPEKTRAL SCANNER (MOMS) DIGITALE SPEICHERUNG DER BILDER]
M. Hoffmann, H. Listmann, and D. Meissner 14 May 1982 9 p In GERMAN; ENGLISH summary Presented at 6th Arbeitskreis Telemetrie e.v.s Telemetriekonf., Garmisch-Partenkirchen, West Ger., 10-14 May 1982
(MBB-UA-686-82-Oe) Avail: Issuing Activity

An imaging instrument for remote sensing to be used on space platforms (Shuttle Pallet Satellite-SPAS, Spacelab, satellites) is presented. The mapping principle is based on electrical scanning with high resolution linear photoarrays (push broom principle, charge coupled devices technology). The scanning is done in several pixel-coincide spectral channels between 0.45 and 1.05 microns by combining several similar modules. Almost any line length can be obtained using the double-lens principle (at present 6912 pixels). The signals are real-time corrected for the different dark signals, for the different sensitivities of the single elements, and for each lens transmittance. The digitized and corrected data are stored on a high density digital recorder.
Author (ESA)

N84-14902# Lumin, Inc., Tuscaloosa, Ala.
REAL TIME OPTICAL INTERFEROMETRIC IMAGE ADDITION AND SUBTRACTION BY WAVE POLARIZATION Final Report
Hua-Kuang Liu 15 Oct. 1981 67 p
(Contract DAAH01-81-C-B120)
(AD-A134125; LUMIN-81-01) Avail: NTIS HC A04/MF A01 CSCL 20/6

A real-time coherent optical interferometric image addition and subtraction system based on a technique similar to an earlier work by Kunstmann and Spitschan is extensively investigated. Theoretical analysis of the system has been compared with experimental data obtained. Distortion and resolution power of the system with respect to the size and positions of the input images have been analyzed in detail. GRA

N84-14903# Pennsylvania Univ., Philadelphia. Electro-optics and Microwave-optics Lab.
HIGH RESOLUTION 3-D TOMOGRAPHIC IMAGING BY WAVE-LENGTH AND POLARIZATION DIVERSITY Annual Report, 30 Jun. 1982 - 29 Jun. 1983
N. H. Farhat 5 Jul. 1983 144 p
(Grant AFOSR-81-0240; AF Proj. 2305)
(AD-A134101; EO/MO-6; AFOSR-83-0797TR) Avail: NTIS HC A07/MF A01 CSCL 14/5

Research in high resolution microwave imaging has to date concentrated broadly on the study and development of efficient and cost-effective data acquisition and image reconstruction methods for use in lambda and polarization diversity 3-D tomographic imaging. The techniques developed combine angular, spectral, and polarization diversity measurements with a unique target derived reference technique to produce images of the scattering centers on complex-shaped bodies with unprecedented resolution and quality that exceed by far anything reported to this date. Analytical studies of information content, speckle suppression and resolution show, however, that image quality can further be enhanced and made to approach and even exceed the resolution of optical systems when the imaging or remote objects specially through the Earth's atmosphere is desired. GRA

N84-14904# Washington State Univ., Pullman. Dept. of Physics.
FOCUSED ACOUSTICAL AND OPTICAL BACKSCATTERING FROM SPHERES AND PROPERTIES OF OPTOACOUSTIC SOURCES Interim Technical Report, 1 Sep. 1982 - 31 Aug. 1983
Philip L. Marston 15 Sep. 1983 54 p
(Contract N00014-80-C-0838)
(AD-A133744; TR-3) Avail: NTIS HC A04/MF A01 CSCL 20/6

This report consists of publications and preprints on topics related to acoustical and optical scattering and to laser optoacoustic sources of sound. The emphasis of Papers 1 and 2 is on the understanding of the enhanced backscattering from spheres associated with axial focusing. The emphasis on Paper 3 is on the modeling of certain cross-polarization and copolarization effects due to the scattering of laser light from small bubbles in water or from fog. GRA

N84-14905# Joint Technical Coordinating Group for Aircraft Survivability, Washington, D.C. Countermeasures Subgroup.
THE AIRCRAFT INFRARED MEASUREMENTS GUIDE Final Report
William L. Capps, Dan Powlette, Stanley E. Tate, Grover S. Amick, and Dan Stowell Mar. 1983 133 p
(AD-A132598; JTCG/AS-81-C-002) Avail: NTIS HC A07/MF A01 CSCL 17/5

A reference source for the aircraft infrared measurement community is proposed. The guide provides standard nomenclature, suggested data formats, calibration requirements (including derived mathematics), and measurement methodology. Chapters are also included on developing test plans and writing the formal report. An extensive bibliography contains sections on calculations aid/equation, calibration, radiometry/spectrometry, and radiation sources. Author (GRA)

N84-14906# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
REVIEW OF CALCULATIONS OF EXTINCTION FOR VISIBLE AND INFRARED WAVELENGTHS IN RAIN Final Report
Bruce T. Miers Aug. 1983 20 p
(DA Proj. 1L1-62111-AH-71)
(AD-A132659; ERADCOM/ASL-TR-0134) Avail: NTIS HC A02/MF A01 CSCL 20/6

Many theoretical and experimental investigations have been done to determine the influence of rain on visible and infrared radiation at single wavelengths under certain meteorological conditions. These studies are summarized in this report and typical results for the extinction of visible and infrared radiation by rain are shown. Basic equations and experimental data from these studies were used to derive the extinction coefficients for selected visible and infrared wavelengths. Theory has predicted and measurements have shown that visible and infrared light are both attenuated by nearly the same amount during rain. Some measurements showed that extinction in heavy rainfall was an order of magnitude less than measured extinction in heavy fog for the 10.6 micrometer wavelength. Author (GRA)

N84-14907# Hughes Research Labs., Malibu, Calif.
MULTIWAVELENGTH BIDIRECTIONAL COUPLER-DECOUPLERS Interim Report, 1 Nov. 1982 - 30 Apr. 1983
Jon Myer and H. W. Yen May 1983 27 p
(Contract DAAB07-82-C-J071; DA Proj. 1L1-62701-AH-92)
(AD-A132908; CECOM-82-C-J071-2; IR-2) Avail: NTIS HC A03/MF A01 CSCL 20/6

This is an exploratory program to develop, fabricate and test a family of active and passive, single and two-fiber, fiber optic multiwavelength, bidirectional, coupler-decoupler modules. The goal of the contract is to have each member of the coupler-decoupler (multiplexer-demultiplexer) family be capable of coupling energy into, and decoupling energy out of, a single optical transmission line, using a minimum of four wavelengths for the simultaneous full duplex transmission of a minimum of four optical channels. The coupler-decoupler will be designed for low throughput loss (< 5 dB per channel, per single pass) and minimum crosstalk (no more than -35 dB of the received optical signal). The modules fabricated during the program will be evaluated for their ability to meet military environmental requirements, particularly with respect to temperature. The approach uses the miniature planar Rowland spectrometer configuration recently developed at Hughes Laboratories (HRL) for NASA as the basic building block for constructing the coupler-decoupler required for this program, eliminating the need for collimating optics, prisms, or thin-film filters. Author (GRA)

N84-14908# Massachusetts Inst. of Tech., Cambridge.
SWITCHABLE ZERO ORDER DIFFRACTION GRATINGS AS LIGHT VALVES Semiannual Report, 1 Jan. - 30 Jun. 1983
John Melngailis 30 Jun. 1983 4 p
(Contract N00014-82-K-0522)
(AD-A133010) Avail: NTIS HC A02/MF A01 CSCL 20/6

The motivation of this work is to produce line-addressable arrays of independently switchable light valves for flat-panel video displays. In addition, such light valves would be useful as spatial light modulators in optical signal processing. The principle of the light valves is based on the switching of the zero order of diffraction. Two gratings are fabricated face-to-face and displaced with respect to one another by half of one period. The displacement may be produced by using the strong piezoelectric properties of PVF2 or, alternatively, by using electrostatic forces. The goal of this project is to build a fast, lockable, miniature light valve which is compatible with fabrication into arrays. GRA

N84-14909# Texas Univ., Austin. Center for Particle Theory.
REALIZATION OF FIRST ORDER OPTICAL SYSTEMS USING THIN LENSES
E. C. G. Sudarshan, N. Mukunda (Indian Inst. of Science, Bangalore), and R. Simon (Indian Inst. of Science, Bangalore) Sep. 1983 18 p refs

(Contract DE-AS05-76ER-03992)
(DE84-002848; DOE/ER-03992/531) Avail: NTIS HC A02/MF A01

A first order optical system is investigated in full generality within the context of wave optics. The problem is reduced to a study of the ray transfer matrices. The simplest such systems correspond to axially symmetric propagation. Realization of such systems by centrally located lenses separated by finite distances is studied. Every axially symmetric first order system is realized using at most three lenses. Among anisotropic systems it is proven that every symplectic ray transfer matrix, and no others, is realized using lenses and free propagations. Suggestions for further study of the general first order system are outlined. DOE

N84-14910# Los Alamos Scientific Lab., N. Mex.
HIGH-SPEED VIDEOGRAPHY FOR OPTICAL AND X-RAY IMAGING
Lawrence E. Bryant, Jr. Sep. 1983 5 p
(Contract W-7405-eng-36)
(DE84-002272; LALP-83-44) Avail: NTIS HC A02/MF A01

The SP-2000 Motion Analysis System, or high speed video, is described, which can record up to 2000 full frames per second or up to 12,000 partial frames persecond with a playback speed of 60 frames per second, thus allowing a slowdown factor of up to 200 times in the recorded action. Data are recorded in digital form, and thus the system can interface with a computer. High speed video is being used to document dynamic events ranging from small scale laboratory experiments to large field tests. The camera also is used to monitor the output fluor of an X-ray sensitive image intensifier for dynamic radiography applications. A typical setup and resulting images are shown. DOE

N84-14911# Fondazione Ugo Bordoni, Rome (Italy).
THE POSSIBILITY OF REDUCTION OF THE SUBJECTIVE REDUNDANCE OF IMAGE SIGNALS WITH PARTICULAR REFERENCE TO CONTOUR CODING [POSSIBILITA DI RIDUZIONE DI RIDONDANZA SOGGETTIVA DEI SEGNALI D'IMMAGINE CON PARTICOLARE RIFERIMENTO ALLA CODIFICAZIONE DEI CONTORNI]
Roberto Cusani (Rome Univ.), Guido DiBlasio (Rome Univ.), Antonino Orlando, and Filomena Papa Dec. 1982 27 p refs In ITALIAN
(FUB-43-1982) Avail: NTIS HC A03/MF A01

The functions of five layers of the retina in the human visual perception system are discussed and used as a base to propose a method for image coding. The original image is subdivised in fractions partially overlapped. Each fraction undergoes a logarithmic compression (Weber Law) and its features are extracted, including unstructured texture, periodic texture, contour elements, and contour elements presenting angles, crossings or terminals. These features are coded separately. The inverse procedure recomposes the image. Author (ESA)

N84-14912# Siemens A.G., Munich (West Germany). Zentralbereich Technik.
OPTICAL MULTIPLEXERS AND DEMULTIPLEXERS FOR OPTICAL WAVELENGTH-DIVISION MULTIPLEX TRANSMISSION SYSTEMS Final Report, Feb. 1982
Gerhard Ensslin, Hans F. Mahlein, Achim Reichelt, and Gerhard Winzer Bonn Bundesministerium fuer Forschung und Technologie Jul. 1983 133 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-167; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 28

Compact micro-optic multi-demultiplexers designed on the beam splitter principle were developed for optical wavelength division multiplex transmission systems with two or three wavelength channels over multimode graded index fibers. No lenses are required. The edge interference filter for separation or combination of the radiation of two different wavelengths or wavelength groups is directly evaporated onto a glass fiber endface, polished at an oblique angle. Since all ports have identical fibers, the multi/demultiplexers are used for both one way and two way communications. The components (all with fiber pigtails) were tested with light emitting diodes at wavelengths of 755, 825, and 1270 nm. The characteristic data of the 2 channel (3 channel) component vary between 1 and 2 dB (1.2 and 1.8 dB) for insertion loss, 11 and 14 dB (11 and 28 dB) for far end crosstalk attenuation and > 40 dB (35 dB) for near end crosstalk attenuation. Author (ESA)

N84-14913# National Bureau of Standards, Boulder, Colo.
MEASUREMENT OF MULTIMODE OPTICAL FIBER ATTENUATION
R. L. Gallawa, G. E. Chamberlain, G. W. Day, D. L. Franzen, and M. Young Jun. 1983 54 p refs
(PB83-151207; NBS-TN-1060) Avail: NTIS CSCL 20F

Optical fiber measurement capabilities at the National Bureau of Standards are described. The measurement of attenuation of multimode, telecommunication-grade fibers for the wavelength range of 850 nm to 1300 nm is stressed. The need for restricted launch conditions, the most fundamental and crucial aspect of precise attenuation measurements are discussed. The limited phase launch (also called the beam optics launch) and the mode filter launch are discussed. Attention then turns to the practical matter of ensuring that the conditions of the restricted launch are met. Discussions of system noise and system linearity are also included. Measurement procedure and results obtained in the laboratory using three typical fibers are described. Results are presented for the two wavelengths of current interest: 850 nm and 1300 nm. GRA

N84-14196*# Rice Univ., Houston, Tex. Space Physics and Astronomy Dept.
OPTICAL MEASUREMENTS OF A LARGE-SCALE LABORATORY BEAM PLASMA DISCHARGE (BPD)
W. Bernstein, G. Mantjoukis, F. H. Leinbach (NOAA, Boulder, Colo.), and T. Hallinan (Alaska Univ., Fairbanks) *In* ESA Active Expts. in Space Jul. 1983 p 177-184 refs (For primary document see N84-14172 05-12)
(Grants NAGw-69; NSF ATM-80-22550)
Avail: NTIS HC A17/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-14914 Princeton Univ., N. J.
IMPURITY POLOIDAL ASYMMETRIES AND PLASMA ROTATION IN THE PDX TOKAMAK Ph.D. Thesis
Kevin Brau 1983 254 p
Avail: Univ. Microfilms Order No. DA8316789

Vertical poloidal asymmetries of carbon and oxygen in the PDX Tokamak were monitored under a variety of discharge conditions in circular plasmas. Near the edge of the plasma and in the region beyond the limiter, the asymmetries appear to be caused by local impurity recycling, variations in the length of the emitting region, and effects due to vertical ion drifts. In the case of C V impurities, the sign and magnitude of the asymmetry is in qualitative agreement with the predictions of a quasi-neoclassical fluid model of impurity transport. A two dimensional computer code is used to simulate different models of poloidal asymmetries, including: (1) poloidally asymmetric source function, (2) charge exchange recombination with neutral hydrogen, (3) poloidally asymmetric electron ensity and temperature profiles, (4) poloidally varying anomalous radial diffusion coefficient, and (5) the quasi-neoclassical fluid model. Dissert. Abstr.

N84-14915 Johns Hopkins Univ., Baltimore, Md.
AN EXTREME ULTRAVIOLET STUDY OF TOKAMAK PLASMAS USING A TIME-RESOLVING SPECTROGRAPH Ph.D. Thesis
Ronald Edmund Bell 1983 161 p

Avail: Univ. Microfilms Order No. DA8315367

A time resolving spectrograph used to study the spectral emissions of the Alcator A (Massachusetts Institute of Technology) and TFR-600 (Association EURATOM-CEA plasmas is described. The survey properties of the spectrograph were used to compare the impurity contents of these two machines, and to study conditions affecting the normal evolution of Tokamak discharges. The spectral emissions of the TFR-600 Tokamak were examined during a series of impurity injection experiments, under conditions of significant and negligible perturbation. Emissions from intrinsic impurities reveal that the conditions for impurity transport were altered in the perturbed case. A systematic search for forbidden (magnetic dipole) lines, useful for ion temperature measurements, was conducted during the impurity injection experiments on TFR-600. Forbidden lines in the FI to BI isoelectronic sequences are presented for ions of Ti, V, Cr, Fe and Ni. Intercombination lines in the MgI isoelectronic sequence were also observed. Dissert. Abstr.

N84-14916 California Univ., Los Angeles.
TRANSPORT AND RADIATIVE PROCESSES IN THE IO PLASMA TORUS Ph.D. Thesis
John David Richardson 1983 106 p
Avail: Univ. Microfilms Order No. DA8314677

The transport and radiative processes occurring in the Io plasma torus are explained. First the transport processes are examined independently and compared with the Voyager 1 density observations. Outside of Io's orbit transport is enhanced by the centrifugally driven interchange instability and locally affected by the ring current precipitation boundary. Inside of Io the density profile is inconsistent with pre-Voyager models of diffusive transport, indicating much slower inward than outward transport. Consideration of energy transfer processes in our model of the cold torus inside of Io allows us to further restrict the possible transport mechanisms in this region. It is shown that neither time dependent injection of ions from Io nor recombination processes adequately explains the ion temperature and density observations. The best fit to the data is obtained using a model combining outward convection and inward diffusion in a steady state situation. Dissert. Abstr.

N84-14917# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
ELECTROSTATIC ION-CYCLOTRON WAVES IN MAGNETOSPHERIC PLASMAS: NON-LOCAL ASPECTS Memorandum Report
G. Ganguli (Science Applications, Inc., McLean, Va.), P. Bakshi (Science Applications, Inc., McLean, Va.), and P. Palmadesso 14 Oct. 1983 36 p
(RR03302)
(NASA-CR-174501; NAS 1.26:174501; AD-A133975; NRL-MR-5197) Avail: NTIS HC A03/MF A01 CSCL 20I

The importance of the effect of the magnetic shear and the finite size of current channel on the electrostatic ion-cyclotron instability for the space plasmas is illustrated. A non-local treatment is used. When the channel width Lc, is larger than the shear length Ls, there is a large reduction in the growth rate along with a noteworthy reduction of the band of the unstable perpendicular wavelengths. For Lc < or = Ls/10 the growth rate is not much altered from its local value, however for Lc/pi i < or = 10 to the second power the growth rate starts falling below the local value and vanishes for Lc pi i. The non-local effects lead to enhanced coherence in the ion cyclotron waves. GRA

N84-14918# Princeton Univ., N. J. Plasma Physics Lab.
ENERGETIC ION BEAM-PLASMA INTERACTIONS Final Report, 1 Mar. 1981 - 28 Feb. 1983
Russell M. Kulsrud 30 Jun. 1983 8 p
(Grant AF-AFOSR-0106-81; AF Proj. 2301)
(AD-A133816; AFOSR-83-0816TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

The main effort was to understand the physics of a very energetic ion beam propagating through a magnetized plasma roughly perpendicular to the magnetic field. It has been appreciated for several years that the central problem is the charge neutralization of this beam. For conditions where ion beam number density is comparable or larger than plasma number density, the motion of the electrons is quite complicated being controlled by the self fields produced by their motion. Thus, to solve this problem it was necessary to construct a rather complex computer code. During the first year of work the general nature of the electron motion was elucidated and a 2-D model for the problem was constructed that was sufficiently realistic to answer the charge neutralization question in general. A rough indication of the necessary amount of charge neutralization, defined as the ratio of the difference of electron and ion number densities in the beam to the ion beam density, obtained and shown to be v/c if the beam divergence is small enough. Also it was shown that the beam would move along a circular orbit with radius equal to the cyclotron radius of an individual beam ion. It was shown that the required axial variation to attain desired charge neutralization were easy to achieve in practice. Thus, it appears entirely possible to propagate an energetic ion beam a long distance through a plasma and to hold it together radially against expansional forces. GRA

N84-14919# Naval Research Lab., Washington, D. C.
NON-LTE RADIATION FROM AN ARGON SEEDED MICROBALLOON IMPLOSION 2 Final Report
P. C. Kepple and K. G. Whitney 15 Sep. 1983 63 p
(Contract DE-AI08-79-DT-40092)
(AD-A133679; AD-E000547; NRL-MR-5182) Avail: NTIS HC A04/MF A01 CSCL 20/9

The results of three LASNEX simulations of Argon seeded DT filled microballoon implosions in which the details of the hot electron preheat have been varied are post analyzed with a full collisional radiative model. The resulting simulated spectra are compared. A similar calculation is performed on a pure argon microballoon implosion. Some features of the average atom model used by LASNEX are compared to those calculated by the collisional radiative model. Author (GRA)

N84-14920# Naval Research Lab., Washington, D. C.
TEARING INSTABILITY IN AN ANISOTROPIC NEUTRAL SHEET
J. Chen and P. Palmadesso 7 Sep. 1983 38 p
(RR03302)
(AD-A132684; NRL-MEMO-5178) Avail: NTIS HC A03/MF A01 CSCL 20/9

A study is made of the collisionless tearing-mode stability properties of a field-reversed plasma layer whose temperature distribution is anisotropic. The plasma is confined by its self magnetic field with no external field. A kinetic description is used for both ions and electrons. The effects of the axis-crossing and nonaxis-crossing orbits are discussed. It is found that the conventional technique of matching the inner and outer asymptotic solutions at the electron inner-region is inadequate for the anisotropic case. An intermediate region in which the axis-crossing ion orbits are important is identified. The eigenvalue equation is solved using both analytic approximations and numerical methods to obtain the eigenmode structure and the linear dispersion relation. GRA

N84-14921# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DYNAMICS OF RAREFIED GAS AND MOLECULAR GAS DYNAMICS
25 Aug. 1983 281 p Transl. into ENGLISH of the book "Trudy Tsentralnogo Aero-Gidrodinamicheskogo Instituta im Prof. M. Ye. Zhukovskogo, no. 1411" Moscow, Otdel TsAGI, 1972 p 1-152
(AD-A132689; FTD-ID(RS)T-0673-83) Avail: NTIS HC A13/MF A01 CSCL 20/4

The special features of the hypersonic flow around bodies in the transition region, which lie between the region of free molecular flows and the zone of flow of gas as continuous medium were analyzed. The simulation of actual conditions in the transition region on the basis of the vast experimental material, obtained in a low pressure wind tunnel is discussed The aerodynamic characteristics of the broad class of bodies are presented. GRA

N84-14922# Arizona Univ., Tucson. Dept. of Nuclear and Energy Engineering.
APPLICATIONS OF HYBRID NUMERICAL-SIMULATION METHODS TO MAGNETIC-CONFINEMENT SYSTEMS Annual Technical Report, 1 Jan. - 31 Dec. 1983
Richard L. Morse 1983 41 p
(Contract DE-AC02-77ET-53001)
(DE84-001840; DOE/ET-53001/5) Avail: NTIS HC A03/MF A01

During this contract period kinetic modeling of wall plasma near divertors or limiters was extended and refined to include, in particular, prediction of sputtering rates. As a result of seeing data indicating edge temperatures below the kinetic range, and some questions about previous fluid modeling, fluid modeling was begun. One of the fluid results which was interesting is a class of solutions which are not stationary but exhibit periodic relaxation oscillations. A possible relationship between these solutions and the H-mode was examined. Also during this period Argon radiation power at typical Tolemak densities and over a wide range of temperatures was calculated. The results have interesting implications for main plasma energy containment and ignition as well as for edge plasma control. DOE

N84-14923# General Atomic Co., San Diego, Calif.
NUMERICAL STUDY OF ELECTROMAGNETIC FLUID TURBULENCE
R. E. Waltz Oct. 1983 49 p refs Presented at the Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Los Angeles, 7 Nov. 1983
(Contract DE-AT03-76ET-51011)
(DE84-002388; GA-A-17276; CONF-831105-1) Avail: NTIS HC A03/MF A01

Nonlinear two fluid equations for the time evolution of the perturbed electrostatic potential, density, vector potential, and ion parallel motion are written for a collisional plasma in toroidal geometry. The nonlinear terms arise from the E tilde x BO convection and magnetic flutter. Simplified two dimensional mode coupling calculations with a fixed average parallel wave number and curvature drift are performed for a variety of perturbed field combinations. The hot ion effects of cross field viscosity and FLR truncate the spectrum at large wave numbers. Stationary turbulent states of the collisions drift or resistive interchange mode for (ALPHA) = 9 and the resistive ballooning mode for 0 < (ALPHA) < (ALPHA)/sub crit/ are obtained, and the associated E tilde x BO and magnetic flutter transport coefficients are calculated. The results are summarized by comparison to simple scaling laws (e.g., n tilde/n0 approx. 1/k/sub perpendicular/L/sub n/, B tilde/sub perpendicular//BO approx. (ALPHA) n tilde/n0, D/sub E/ approx. (BETA)/k/sub perpendicular/(2)). DOE

N84-14924# Los Alamos Scientific Lab., N. Mex.
STUDY OF LIMITER DAMAGE IN A MAGNETIC-FIELD ERROR REGION OF THE ZT-40M EXPERIMENT
H. Makowitz (Brookhaven National Lab.) 1983 6 p ref Presented at the 3rd Top. Meeting on Fusion Reactor Mater., Albuquerque, N. Mex., 19-22 Sep. 1983
(Contract W-7405-eng-36)
(DE84-001711; LA-UR-83-2972; CONF-830942-57) Avail: NTIS HC A02/MF A01

Observations of the evaporation and cracking to TiC coatings, initially placed on an AXF-5Q Graphite mushroom limiter, installed in a high field error region were investigated. The thermal and stress behavior of the limiter and coating materials undergoing plasma material heat exchange processes were studied, in order to infer the magnitude of heat flux necessary to explain the observed material damage. In addition the vacuum (liner) wall material behavior was studied parametrically using the same heat flux values as the limiter study. A one dimensional conduction model was used with applied heat and radiation boundary conditions, for predicting temperature distributions in space and time, where the thermal stress was calculated using a restrained in bending only plate model. Wall loadings corresponding to first wall, limiter energy fluxes ranging between 1 x 10(2) W/cm(2) and 1 x 10(5) W/cm(2) were used as parameters with plasma material interaction times (tau/sub Q0) between 0.5 ms and 10 ms. Short plasma energy deposition time (tau/sub Q0/ 10 ms) spatial and time histories of temperature and stress were calculated for SS-304, Inconel-625, TiC and AXF -5Q graphite materials. DOE

N84-14925# Stanford Linear Accelerator Center, Calif.
PLASMA BEAT-WAVE ACCELERATOR
Robert J. Noble Jun. 1983 4 p refs Presented at the 12th Intern. Conf. on High Energy Accelerators, Batavia, Ill., 11 Aug. 1983
(Contract DE-AC03-76SF-00515)
(DE84-001601; SU-SLAC-PUB-3149; CONF-830822-33) Avail: NTIS HC A02/MF A01

An analytic study of some quantities relevant to the plasma beat-wave accelerator (PBWA) concept were performed. Analytic expressions for the plasma frequency, longitudinal electron velocity, plasma density and longitudinal plasma electric field of a nonlinear longitudinal electron plasma oscillation with amplitude less than the wave-breaking limit and phase velocity approaching the speed of light were obtained. The luminosity of a single-pass e(+)e(-) linear PBWA collider assuming the energy and collision bremstrahlung are fixed parameters was estimated. DOE

N84-14926# Georgia Inst. of Tech., Atlanta.
EFFECTS OF NEUTRAL BEAM INJECTION ON IMPURITY TRANSPORT IN TOKAMAKS
W. M. Stacey, Jr. and D. J. Sigmar (ORNL) Sep. 1983 36 p refs
(Contract DE-AS05-78ET-52025)
(DE84-001857; GTFR-43) Avail: NTIS HC A03/MF A01

A self consistent theory is presented for particle flows in the flux surface, radial particle fluxes and the radial electric field in a Tokamak. The effects of beam impurity momentum exchange, radial transfer of toroidal momentum, and the poloidal variation in density and potential which ensue when v sub phi approx. = v sub th are treated. The interaction among these effects is nonlinear. Model problem predictions based on the theory indicate enhanced inward impurity transport with strong counter injection and outward impurity transport with strong coinjection of neutral beams. DOE

N84-14927# Argonne National Lab., Ill. Office of Fusion Power Program.
COUPLING BETWEEN ANGULAR DEFLECTION AND EDDY CURRENTS IN THE FELIX PLATE EXPERIMENT
L. R. Turner and J. W. Cuthbertson Aug. 1983 16 p refs
(Contract W-31-109-eng-38)
(DE84-001509; ANL/FPP/TM-176) Avail: NTIS HC A02/MF A01

For a conducting body experiencing superimposed changing and steady magnetic field, for example, a limiter in a Tokamak during plasma quench, the induced eddy currents and the deflections resulting from those eddy currents are coupled. Experimental study of these coupled deflections and currents can be performed with the FELIX (Fusion Electromagnetic Induction Experiment) facility nearing completion at ANL. Predictions of the coupling are described, as computed with the code EDDYNET, which was modified for this purpose. Effects of the coupling is readily observable experimentally. In the FELIX plate experiment, the coupling between deflection and eddy currents was readily calculated because the rigid body rotation of the plate is equivalent to a contrarotation of the applied magnetic fields. For a geometry such as a plasma limiter, in which the eddy currents would cause a deformation of the conducting body, an analysis of the coupling between eddy currents and deformation would require a structural analysis code and an eddy current code to be simultaneously computing from the same mesh. DOE

N84-14928# Los Alamos Scientific Lab., N. Mex.
FILAMENTATION INSTABILITY ASSOCIATED WITH A RELATIVISTIC BEAM AND A FINITE-TEMPERATURE, COLLISIONAL

PLASMA
Lester E. Thode, John R. Cary, Michael E. Jones, Michael A. Mostrom, and Barry S. Newberger Aug. 1983 16 p refs
(Contract W-7405-eng-36)
(DE84-002303; LA-9785) Avail: NTIS HC A02/MF A01

An unmagnetized, homogeneous, ordinary mode interaction associated with a scattered relativistic electron beam and a finite temperature, collisional plasma is investigated. Both isotropic plasma temperature and collisions are destabilizing. Depending upon plasma temperature, collisions can either decrease or increase the growth rate. The growth rate is only weakly dependent upon the form of the beam distribution function, but the unstable spectrum is limited to shorter wave numbers for the scattered relativistic distribution. With a finite collision rate and under conditions of good current neutralization, only a finite boundary can suppress the instability. Numerical solutions indicate the filamentation instability is probably not responsible for observed beam disturbances in the 20 MeV PHERMEX beam propagation experiments. DOE

N84-14929# General Atomic Co., San Diego, Calif.
MAGNETIC FLUCTUATIONS IN HIGH-BETA SUB p TOKAMAK PLASMAS
J. K. Lee, M. S. Chu, F. J. Helton, and W. Park (Princeton Plasma Physics Lab., N.J.) Jun. 1983 8 p refs Presented at the 11th European Conf. on Controlled Fusion and Plasma Phys., Aachen, 5 Sep. 1983
(Contract DE-AT03-76ET-51011)
(DE83-015872; GA-A17142) Avail: NTIS HC A02/MF A01

The magnetic fluctuations resulting from the nonlinear evolutions of high beta sub p long parallel wavelength resistive MHD modes are studied for Tokamak plasmas with a free boundary. Large amplitude fluctuations cause increased magnetic field stochasticity with increasing epsilon beta sub p. These fluctuations, when coupled to an anomalous energy loss mechanism, may lead to beta sub p saturation in total input power. Modeling of the H mode with a line tied plasma to the divertor plate shows substantial stabilization of edge instabilities. Calculations for high beta noncircular discharges in DIII compare well with experimental observations. DOE

N84-14181# Academy of Sciences (USSR), Moscow. Space Research Inst.
PLASMA PARTICLE ACCELERATION DUE TO EMISSION OF GROUND-BASED AND ONBOARD TRANSMITTERS
A. P. Babaev, S. B. Lyakhov, G. G. Managadze, A. A. Martinson, and P. P. Timofeev *In* ESA Active Expts. in Space Jul. 1983 p 61-65 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14189# Norwegian Defence Research Establishment, Kjeller.
PLASMA HEATING GENERATED BY A ROCKET-BORNE ELECTRON ACCELERATOR
P. Ingsoey and M. Friedrich (Technische Univ., Graz) *In* ESA Active Expts. in Space Jul. 1983 p 129-136 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14191# Institute of Space and Astronautical Science, Tokyo (Japan).
HIGHLIGHTS OF THE ELECTRON BEAM EXPERIMENTS IN SPACE IN JAPAN
Nobuki Kawashima *In* ESA Active Expts. in Space Jul. 1983 p 141-149 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14192# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
BEAM PLASMA DISCHARGE AND SUPRATHERMAL ELECTRON TAILS
A. A. Galeev, R. Z. Sagdeev, V. D. Shapiro, and V. I. Shevchenko *In* ESA Active Expts. in Space Jul. 1983 p 151-155 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14193*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
A SECOND KIND OF BEAM-PLASMA DISCHARGE (BPD): ROCKET AND LABORATORY RESULTS
Paul J. Kellogg and Steven J. Monson *In* ESA Active Expts. in Space Jul. 1983 p 157-159 refs (For primary document see N84-14172 05-12)
(Grant NsG-5373; Contracts NA79RA-C-00051; NOAA-03-78-BO1-60)
Avail: NTIS HC A17/MF A01 CSCL 20I

N84-14194# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
PLASMA PROCESSES IN THE REGION OF ELECTRON BEAM INJECTION FROM A HIGH ALTITUDE PAYLOAD
G. G. Managadze, W. Riedler (Technische Univ. Graz), B. M. Balebanov, M. Friedrich (Technische Univ. Graz), T. I. Gagua, Z. Klos (Polish Academy of Sciences, Warsaw), N. A. Laliashvili (Georgian Academy of Sciences, USSR), N. A. Leonov (Kiev Univ.), S. B. Lyakhov, A. A. Martinson et al *In* ESA Active Expts. in Space Jul. 1983 p 161-169 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14197# Institute of Space and Astronautical Science, Tokyo (Japan).
BEAM PLASMA DISCHARGE (BPD) EXPERIMENTS IN THE LABORATORY
N. Kawashima, S. Sasaki, K. Takahashi, and T. Obayashi *In* ESA Active Expts. in Space Jul. 1983 p 181-184 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14198*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INITIAL EXPERIMENTAL RESULTS FROM A LABORATORY SIZE BEAM PLASMA DISCHARGE DEVICE
A. Konradi, W. Bernstein (Rice Univ.), D. L. Bulgher (Rice Univ.), J. O. Garrity (Rice Univ.), and J. L. Winkler (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) *In* ESA Active Expts. in Space Jul. 1983 p 185-188 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14199# Hulburt (E. O.) Center for Space Research, Washington, D.C. Space Plasma Diagnostics Group.
SUPRATHERMAL ELECTRON TAIL DISTRIBUTIONS IN A SPACE-SIMULATION BEAM PLASMA DISCHARGE
E. P. Szuszczewicz, D. N. Walker, H. R. Anderson (Science Applications Inc., Bellevue, Wash.), and K. Papadopoulos (Maryland Univ., College Park) *In* ESA Active Expts. in Space Jul. 1983 p 189-192 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14200# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
MODELING OF BEAM-PLASMA DISCHARGE IN THE LABORATORY
S. B. Lyakhov, A. D. Mayorov, G. G. Managadze, L. Yu. Kochmarev, E. G. Shustin, M. Friedrich (Technische Univ. Graz), W. Riedler (Technische Univ. Graz), Z. Klos (Polish Academy of Sciences, Warsaw), and N. A. Leonov (Kiev State Univ.) *In* ESA Active Expts. in Space Jul. 1983 p 193-196 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14201# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
DYNAMICS OF QUASINEUTRAL BEAMS
R. Treuman, O. H. Bauer, G. Haerendel, and B. Haeusler *In* ESA Active Expts. in Space Jul. 1983 p 197-206 refs (For primary

document see N84-14172 05-12)
(Contracts BMFT-Ref-01D0074A; BMFT-RV-14-B7-74)
Avail: NTIS HC A17/MF A01

N84-14202*# New Hampshire Univ., Durham.
PLASMA JET EFFECTS ON THE IONOSPHERIC PLASMA
T. E. Moore, R. L. Arnoldy, L. J. Cahill (Minnesota Univ., Minneapolis), and P. M. Kintner (Cornell Univ., Ithaca, N.Y.) *In* ESA Active Expts. in Space Jul. 1983 p 207-212 refs (For primary document see N84-14172 05-12)
(Grants NAG6-12; NAGw-52; NAG5-601; NAG6-11)
Avail: NTIS HC A17/MF A01 CSCL 20I

N84-14206# Uppsala Ionospheric Observatory (Sweden).
EXPERIMENTAL AND THEORETICAL ASPECTS OF THE GENERATION OF MHD WAVES BY CHEMICAL RELEASES IN THE IONOSPHERE
Gunnar Holmgren *In* ESA Active Expts. in Space Jul. 1983 p 249-253 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14218# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PLASMA CONFINEMENT AND INTERACTION EXPERIMENTS
Gerhard Haerendel *In* ESA Active Expts. in Space Jul. 1983 p 337-340 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

N84-14223*# TRW Space Technology Labs., Redondo Beach, Calif. Space Sciences Dept.
WAVES IN SPACE PLASMAS (WISP): A SPACE PLASMA LAB ACTIVE EXPERIMENT
R. W. Fredricks *In* ESA Active Expts. in Space Jul. 1983 p 369-375 refs (For primary document see N84-14172 05-12)
(Contract NAS8-33971)
Avail: NTIS HC A17/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-14930 State Univ. of New York, Stony Brook.
HIGH SENSITIVITY COMPARISON OF POTENTIAL DIFFERENCES BETWEEN TWO JOSEPHSON JUNCTIONS Ph.D. Thesis
Jaw-Shen Tsai 1983 215 p
Avail: Univ. Microfilms Order No. DA8315086

The experimental and theoretical exactness of the Josephson voltage frequency relation and its relation to the accuracy of quantum electrodynamics as well as the possible discrepancy between them are discussed. The electrochemical potential difference between two Josephson junctions was compared by putting them in a DC SQUID configuration, and biasing them on a microwave induced constant voltage step. The flux in the DC SQUID was measured by an RF SQUID coupled to the DC SQUID by a superconducting flux transformer. Possible sources of noise such as the asymmetry of the system, thermoelectric effects and relativistic effects are considered and the design and the fabrication of the DC SQUID components are described. The relative exactness of the Josephson relation between two similar junctions is established to less than one part in 10 to the 17th power. The possibility of measuring the gravitational redshift is also discussed. Dissert. Abstr.

N84-14931 State Univ. of New York, Albany.
DEFECT STUDIES IN SEMICONDUCTORS Ph.D. Thesis
Satya Narayan Sahu 1983 208 p
Avail: Univ. Microfilms Order No. DA8313739

Extended Huckel parameters for the band structure of III-V compounds semiconductors are established. Rutherford backscattering studies reveal the thermal properties (like diffusion) of some of the transition metal impurities. The study of hydrogen-related defects in both crystalline and amorphous silicon is emphasized. A correlation between the SiH vibrational frequency and the bond character of the Si-H bond is established along with a similar relationship between the observed frequency and sum of the electronegativity of the neighboring atoms. From these connections many observed IR bands are assigned different structures and their appealing behavior explained. Potential energy calculations predict the existence of molecular hydrogen in c-Si at room temperature. This concept resolves many of the inconsistencies in different fields of experiments. For example, molecular hydrogen fits well with channelling data, spectroscopic results, thermal properties (diffusion, solubility) in crystalline silicon. Besides, its applicability can further be extended to interpret the observed facts in amorphous silicon. Dissert. Abstr.

N84-14932*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SILICON CARBIDE, A HIGH TEMPERATURE SEMICONDUCTOR
J. Anthony Powell 1983 7 p refs Presented at Cleveland Electron. Conf. (CECON '83), Cleveland, 4-6 Oct. 1983; sponsored by IEEE
(NASA-TM-83514; E-1861; NAS 1.15:83514) Avail: NTIS HC A02/MF A01 CSCL 20L

Electronic applications are described that would benefit from the availability of high temperature semiconductor devices. Potential materials for these devices are compared and the problems of each are discussed. Recent progress in developing silicon carbide as a high temperature semiconductor is described. Author

N84-14933# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
POINT-BY-POINT MATRIX EFFECT CALIBRATION FOR THE QUANTITATIVE ANALYSIS OF LAYERED SEMICONDUCTORS BY SECONDARY ION MASS SPECTROMETRY Interim Technical Report
A. A. Galuska and G. H. Morrison 13 Oct. 1983 31 p Submitted for publication
(Contract N00014-80-C-0538; NR Proj. 051-736)
(AD-A134099; TR-12) Avail: NTIS HC A03/MF A01 CSCL 20/12

Point-by-point matrix effect calibration is applied to a variety of AlxGa1-xAs multilayer-multimatrix samples grown by molecular beam epitaxy. The procedure uses the linear dependence of secondary ion yields and sputtering yields on matrix composition to quantify depth profiles through matrix gradients and interfaces. The proposed method provides accurate results in the analysis of samples too complex for conventional quantitative analysis by secondary ion mass spectrometry. Author (GRA)

N84-14934# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LASER PHOTODEPOSITION AND PHOTOETCHING STUDY Progress Report, 1 Jan. - 31 Mar. 1983
D. H. Ehrlich 31 Mar. 1983 29 p
(Contract F49620-80-C-0002; AF Proj. 2305)
(AD-A134095; AFOSR-83-0849TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

Work during this quarter has developed a new technique for direct-write etching of Al and Al:Si:Cu alloys, and has applied this new process to correction of bridging faults in VLSI signal-processing circuits. Additional work has expanded upon two excimer-laser resist processes to develop fast deep-UV lithographic procedures based on these powerful UV sources. A final series of experiments has extended pulsed UV-laser reactions to area photodeposition of Al2O3 films. GRA

N84-14935# University of Southern California, Los Angeles.
STUDIES OF THE ELECTRONIC PROPERTIES OF TWO-DIMENSIONALLY CONFINED CARRIERS IN MIS (METAL-INSULATOR-SEMICONDUCTOR) INVERSION/ACCUMULATION LAYERS, HETEROJUNCTIONS AND QUANTUM WELLS Final Report, 1 Dec. 1977 - 31 Mar. 1983

A. Madhukar 17 May 1983 49 p
(Grant AF-AFOSR-3530-78; AF Proj. 2306)
(AD-A134094; AFOSR-83-0767TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report states the results of several investigations of the one and many electron transport, magneto-transport, optical and magneto-optical properties of quasi two-dimensionally confined charge carriers realized in metal-insulator-semiconductor (MIS) inversion or accumulation layers, heterojunctions, and multiple, isolated or coupled, quantum well structures involving III-V compound semiconductors and their alloys. GRA

N84-14936# Geoscience, Ltd., Solana Beach, Calif.
THERMAL PROPERTY MEASUREMENT TECHNIQUES AND SOME RESULTS FOR CdTe Quarterly Report, 10 Jun. - 10 Sep. 1983
H. F. Poppendiek, D. J. Connelly, and C. M. Sabin 10 Sep. 1983 12 p
(Contract MDA903-83-C-0156; ARPA Order 4733)
(AD-A133899; GLM-333; QR-2) Avail: NTIS HC A02/MF A01 CSCL 20/12

This Quarterly report describes the techniques used to measure the thermal coefficient of expansion and the emissivity of Cadmium Telluride. It presents some results found using these techniques. The report also describes a gradient layer calorimeter that will be used to measure the specific heat of semiconductor materials at high temperatures. GRA

N84-14937# Massachusetts Inst. of Tech., Cambridge.
A MODEL FOR SUPERCONDUCTIVITY IN GRAPHITE INTERCALATION COMPOUNDS
R. Al-Jishi 30 Dec. 1982 19 p
(Contracts F49620-83-C-0011; F49620-81-C-0006; AF Proj. 2306)
(AD-A133862; AFOSR-83-0762TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

The observed superconductivity in the stage 1 graphite-alkali metal intercalation compounds (GICs) is modeled using both graphite Pi-bands and intercalate s-bands. The anisotropy observed in the superconducting properties is explained in terms of the anisotropy of the Fermi surfaces of the GICs. GRA

N84-14938# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
THE ANOMALOUS MAGNETORESISTANCE OF GRAPHITE AT HIGH MAGNETIC FIELDS
G. Timp, P. D. Dresselhaus, T. C. Chieu, G. Dresselhaus, and Y. Lye (Bell Labs., Murray Hill, N.J.) May 1983 18 p
(Contract F49620-83-C-0011; AF Proj. 2306)
(AD-A133861; AFOSR-83-0760TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

The angular dependence of the high field magnetoresistance anomaly in graphite is reported. The observed angular dependence is consistent with the functional form for the phase boundary of a charge density wave transition suggested Yoshioka and Fukuyama. Sharp periodic features in the resistivity occurring after the onset of the anomaly are reported. GRA

N84-14939# Florida Univ., Gainesville. Dept. of Electrical Engineering.
STUDY OF 1/f NOISE IN SOLIDS Annual Report, 16 Jun. 1982 - 15 Jun. 1983
Carolyn M. VanVliet and Gijs Bosman 1983 138 p
(Grant AF-AFOSR-0226-82; AF Proj. 2305)
(AD-A133856; AFOSR-83-0798TR) Avail: NTIS HC A07/MF A01 CSCL 20/12

Noise measurements were made on gold metal films. The noise above 150K is of the form 1/f to the 1.2 power; below 150K the noise goes as 1/f with a maximum near 80K, then a continued decrease. The noise in GaAs n+n-n+ mesas of submicron dimensions is very low. The Hooge parameter is of the order of 10 to the minus 7th power, indicating that collisions are nearly absent. Intervally electron transfer is noticeable in samples with 1.1 micrometer dimensions. The n+p-n+ structures have a great deal of noise associated with the prepunch-through current. This is attributed to recombination of injected electrons via empty acceptors, since in the unexcited specimen there are no holes due to electron spillover. For the first time 1/f noise was observed in radioactive alpha particle decay from 241 Americium. This noise was deduced from counting statistics using the Allan variance theorem. Calculations yielded quantitative accounts for the mobility-fluctuation noise associated with impurity scattering for silicon and gold. GRA

N84-14940# Rensselaer Polytechnic Inst., Troy, N. Y.
PRESSURE QUENCHED EXCITONIC SOLIDS Annual Report, Jul. 1981 - Jul. 1982
Edmond Brown Jul. 1982 8 p
(Grant AF-AFOSR-0126-79; AF Proj. 2301)
(AD-A133817; AFOSR-83-0790TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

Theoretical models based on trapped magnetic flux have been tried in order to account for the behavior encountered in some early samples of cadmium sulfide in a slowly varying magnetic field. These models fail to account for the ferromagnetic behavior seen at high fields, of the order of ten kilogauss, although they qualitatively fit the behavior for fields below one kilogauss. The models make use of a network of superconducting filaments containing a non equilibrium distribution of trapped flux which can re-orient itself in a varying magnetic field so as to reduce the free energy of the system. Such a network is similar to an array of superconducting loops which are orientable although not completely free. If the low field strong diamagnetism is to be attributed to superconductivity, as has been previously suggested we are not yet able to incorporate the high field behavior into such a picture. It is possible that the behavior seen in some samples of cuprous chloride and in cadmium sulfide are due to a not yet understood mechanism. GRA

N84-14941# Westinghouse Electric Corp., Pittsburgh, Pa.
MSW (MAGNETOSTATIC WAVE) VARIABLE TIME-DELAY TECHNIQUES Final Technical Report, 1 Oct. 1980 - 31 Oct. 1982
J. D. Adams, S. N. Bajpai, M. R. Daniel, P. R. Emtage, and S. H. Talisa Hanscom AFB, Mass. RADC Sep. 1983 185 p
(Contract F19628-80-C-0150; AF Proj. 2305)
(AD-A133770; Rept-82-6F3-DELAY-R4; RADC-TR-83-139) Avail: NTIS HC A09/MF A01 CSCL 20/2

Studies of magnetostatic wave (MSW) propagation, in epitaxial yttrium iron garnet (YIG) aimed at the development of dispersive delay lines electronically variable delay lines for use in radar and ECM systesms are described. Techniques which show the potential for achieving the performance required for systems application of MSW delay lines have been developed. The most pressing problem area is the reduction of amplitude and phase ripple arising from reflections and higher order mode interference to acceptable levels. GRA

N84-14942# Stanford Univ., Calif.
LASER AND ELECTRON BEAM PROCESSING OF SEMICONDUCTORS: CW BEAM-RECRYSTALLIZED POLYSILICON AS A DEVICE-WORTHY MATERIAL Interim Technical Report, 1 Jan. 1978 - 31 Dec. 1980
James F. Gibbons 31 Dec. 1980 132 p
(Contract MDA903-78-C-0128; ARPA Order 3493)
(AD-A133759) Avail: NTIS HC A07/MF A01 CSCL 20/12

Research on the use of directed energy sources, particularly CW lasers and electron beams, for semiconductor processing operations has been carried out at Stanford under the principal sponsorship of DARPA since January 1, 1978. Over the two years from January 1, 1978 to December 31, 1980, research effort has been concentrated on three principal topics: (1) Use of lasers and electron beams for annealing ion implanted silicon under solid phase conditions; (2) Use of lasers and arc sources for recrystallization of thin polysilicon films and a study of the device potential of this material; and (3) Use of CW lasers and electron beams for promoting metal silicide reactions. In the following report we collect papers that describe the CW beam recrystallization of thin polysilicon films and the use of this material for device and integrated circuit fabrication. A subsequent report will collect and summarize papers on silicide formation. GRA

N84-14943# Stanford Univ., Calif. Solid-State Electronics Lab.
LASER AND ELECTRON BEAM PROCESSING OF SEMICONDUCTORS: CW BEAM PROCESSING OF ION IMPLANTED SILICON Interim Technical Report, 1 Jan. 1978 - 31 Dec. 1980
James F. Gibbons 31 Dec. 1980 100 p
(Contract MDA903-78-C-0128; ARPA Order 3493)
(AD-A133758; SU-SSEL-11-79) Avail: NTIS HC A05/MF A01 CSCL 20/12

Research on the use of directed energy sources, particularly CW lasers and electron beams, for semiconductor processing operations has been carried out at Stanford under the prinicipal sponsorship of DARPA since January 1, 1978. Over the two years from January 1, 1978 to December 31, 1980, research effort has been concentrated on three principal topics: (1) Use of lasers and electron beams for annealing ion implanted silicon under solid phase conditions; (2) Use of lasers and arc sources for recrystallization of thin polysilicon films and a study of the device potential of this material; and (3) Use of CW lasers and electron beams for promoting metal silicide reactions. In the following report we collect papers on the annealing of ion implanted silicon published during the period of time indicated above. A brief summary of the papers has been prepared to provide an overview of the work. Two subsequent reports will collect and summarize papers published on polysilicon and silicide formation, respectively. GRA

N84-14944# IBM Watson Research Center, Yorktown Heights, N.Y.
STUDY OF THE PHYSICS OF INSULATING FILMS AS RELATED TO THE RELIABILITY OF METAL-OXIDE SEMICONDUCTOR DEVICES Final Technical Report, 1 Dec. 1980 - 30 Nov. 1982
D. R. Young and D. J. DiMaria Aug. 1983 246 p
(Contract MDA903-81-C-0100; ARPA Order 4102)
(AD-A133674; AD-E401078) Avail: NTIS HC A11/MF A01 CSCL 20/12

The papers enclosed with this report include: a new method for studying hot electron energy distributions in SiO2, plasma enhanced chemical vapor deposition of Si-rich SiO2, the use of Si-rich SiO2 to greatly reduce electron trapping effects, the use of Si-rich SiO2 to increase the yield of thin film capacitors, ellipsometry measurements of polycrystalline silicon films and the use of a delay time technique to measure the diffusion of the oxidant in SiO2 films. Author (GRA)

N84-14945# Battelle Columbus Labs., Durham, N. C.
WORKSHOP ON SOLID STATE SWITCHES FOR PULSED POWER Final Report
W. M. Portnoy and M. Kristiansen 31 May 1983 370 p Workshop held at Tamarron, Colo., 12-14 Jan. 1983
(Contract DAAG29-81-D-0100)
(AD-A132687) Avail: NTIS HC A16/MF A01 CSCL 10/2

A Workshop on Solid State Pulsed Power Switching was conducted by Texas Tech U at Tamarron, Colorado, in January, 1983 for the US Army Research Office. The Workshop addressed the state-of-the-art in solid state switching, particularly semiconductor switches, and new solid state related switching concepts for pulsed power applications. An important objective of the Workshop was to establish research priorities. Group discussions were augmented by invited presentations. The principal topics included opening switches, high power closing switches, extremely fast risetime closing switches and state transition switches; devices of particular interest were thyristors, avalanche switches and the optically triggered intrinsic switch. The invited papers, along with summaries of the Working Group discussions and recommendations, are presented in this report. A general summary, including suggested research topics, is included. Author (GRA)

N84-14946# California Univ., Santa Barbara. Dept. of Physics.
SQUEEZABLE ELECTRON TUNNELING JUNCTIONS
John Moreland, S. Alexander, M. Cox, R. Sonnenfeld, and P. K. Hansma Sep. 1983 11 p
(Contract N00014-78-C-0011)
(AD-A132884) Avail: NTIS HC A02/MF A01 CSCL 20/10

We report a versatile new technique for constructing electron tunneling junctions with mechanically-adjusted artificial barriers. I-V curves are presented for tunneling between Ag electrodes with vacuum, gas, liquid or solid in the barrier. An energy gap is apparent in the measured I-V curve when tunneling occurs between superconducting Pb electrodes. Author (GRA)

N84-14947# University of Southern California, Los Angeles. Dept. of Materials Science.
EVALUATION OF GALLIUM NITRIDE FOR ACTIVE MICROWAVE DEVICES Final Report, Jun. 1981 - Sep. 1982
M. Gershenzon Jul. 1983 52 p
(Contract N00014-81-K-0567; RR02102)
(AD-A132988) Avail: NTIS HC A04/MF A01 CSCL 20/12

Low temperature photoluminescence results that donors in GaN are relatively shallow, so that low resistivity n-type material at room temperature is easily achieved. However, all 'shallow' acceptors are quite deep, so that low resistivity p-type material is not possible. Thus, high current density, p-n junctions are not feasible. A native shallow donor, probably a simple nitrogen vacancy, is present in all GaN crystals grown, whether by VPE, MOCVD, and from these results, by MBE. It is present in the range 10 to the 18th power to 10 to the 20th power per cu cm. This doping level is much too high for it to be used in the drift region of an IMPATT device. Its value can be reduced by compensation with acceptors. But this also lowers the mobility, leading to an increase of the required electric field to attain saturated drift velocity, thus negating the advantage. The native donor density cannot be reduced by altering growth conditions in VPE, MOCVD or MBE growth. It can, however, be somewhat reduced by ion implantation of N(+) ions, followed by a specified anneal. This, however, leads to a meta-stable situation wherein device degradation seems highly likely. Thus, in spite of its theoretical potential, GaN may not be a good candidate as a material for transit-time-limited, power microwave amplifiers. Author (GRA)

N84-14948# Stanford Univ., Calif.
JOINT SERVICES ELECTRONICS PROGRAM Annual Progress Report, 1 Apr. 1981 - 31 Mar. 1983
Aug. 1983 98 p
(Contract DAAG29-81-K-0057)
(AD-A132992; APR-2) Avail: NTIS HC A05/MF A01 CSCL 20/12

Contents: Properties of Materials; Application of Channeling Radiation to a Study of the Properties of Materials; Physics and Technology of Submicron Devices; Real-Time Statistical Data Processing; Fast Algorithms and VLSI Architectures; and Signal Processing and Compression. GRA

N84-14949# Sandia Labs., Albuquerque, N. Mex.
ION-IMPLANTED STRAINED-LAYER SUPERLATTICE DEVICE
D. R. Myers, T. E. Zipperian, R. M. Biefeld, and J. J. Wiczer 1983 5 p refs Presented at the Intern. Electron Device Meeting, Washington, D.C., 5 Dec. 1983
(Contract DE-AC04-76DP-00789)
(DE84-000101; SAND-83-1639C; CONF-831243-2) Avail: NTIS HC A02/MF A01

High quality p-n junction diodes are demonstrated in Be(+)-implanted GaAs/sub x/P/sub 1-x//GaP strained layer superlattices (SLSs). This is the first demonstration of electrical activation of an implanted species with useful electrical characteristics in an SLS. X-ray diffraction indicates that the superlattice structure survived the implantation and annealing, and room temperature electrical measurements indicate diode ideality factors of approx. 2.0 over seven decades of forward current for these devices. Diodes formed in SLSs with n-type background doping of 10(17)cm

(-3) exhibit room temperature reverse leakage currents of 1.5 x 10(-7) A/cm(2) at approx. -10V. The abrupt avalanche breakdown (at 100 (SIGMA)A) of these unpassivated devices occurs at -18V. The diodes show an uncoated peak external quantum efficiency of 30% for photons with energies slightly above the superlattice bandgap of 2.1eV. DOE

N84-14950# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
THERMODYNAMICS OF CONDENSED IONIC SYSTEMS
Kenneth S. Pitzer Sep. 1983 33 p refs Presented at the NATO Advanced Study Inst. Conf. on Phys. and Chem. of Electrons and Related Ions in Condensed Matter, Cambridge, England, 5-17 Sep. 1983
(Contract DE-AC03-76SF-00098)
(DE84-001823; LBL-16634; CONF-8309173-1) Avail: NTIS HC A03/MF A01

In considering the thermodynamics of condensed ionic systems, primary emphasis is given to those types which were not widely investigated, at least until recently. Special attention is given to systems continuously miscible from the fused salt to dilute solution in a polar solvent. Mixed fused salts are also considered as well as phase separation and critical phenomena for any type of ionic system. The most important theories are given briefly. The status of more complex or less important theories is described. Semi-empirical equations are discussed where they are the best method of representing the experimental data. Author

N84-14951# Los Alamos Scientific Lab., N. Mex.
IMPURITIES IN THE HEAVY-FERMION SUPERCONDUCTOR UBe13
J. L. Smith, Z. Fisk, J. O. Willis, B. Batlogg (Bell Telephone Labs.), and H. R. Ott (Eidgenoessische Technische Hochschule-Hoenggerberg) 1983 20 p refs Presented at the MMM Conf., Pittsburgh, 8-11 Nov. 1983 Sponsored in part by Schweizerische Nationalfonds zur Foederung der Wissenschaftlichen Forschung
(Contract W-7405-eng-36)
(DE84-001731; LA-UR-83-3064; CONF-831187-7) Avail: NTIS HC A02/MF A01

Small amounts of Sc, Lu, Gd, Np, Ce, Th, La, and Ba were substituted for uranium in UBe13 to observe their effects. The thorium, which was the most complete study, resulted in an extremely unusual nonmonotonic depression of the transition temperature for a nonmagnetic impurity. This comes from an interplay that exists between the lowest temperature resistivity peak and the transition temperature, as the peak is depressed. These results suggest that heavy Fermion behavior is only a necessary condition for heavy Fermion superconductivity. All of the impurities tested resulted in a transition temperature depression. DOE

N84-14952# Sandia Labs., Albuquerque, N. Mex.
ION CHANNELING ANALYSIS OF GaAs/SUB X/P/SUB 1-X/GaP STRAINED-LAYER SUPERLATTICES
S. T. Picraux, R. M. Biefeld, G. C. Osbourn, and W. K. Chu (North Carolina Univ.) 1983 9 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract DE-AC04-76DP-00789)
(DE84-002536; SAND-83-2277C; CONF-831174-7) Avail: NTIS HC A02/MF A01

Axial ion channeling and backscattering with 2 MeV (4)He are used to probe the strain in GaAs 16P 84/GaP strained-layer superlattices (SLS) by two methods. The tetragonal distortions in the growth direction of SLS's give rise to alternating tilts in inclined crystal directions at each interface. In the first method the large increase in dechanneling along <110 directions containing the angular tilts is measured relative to the negligible increase in dechanneling along the <100 growth direction. This method provides a sensitive depth-dependent measure of strain but requires computer simulation for quantitative analysis. In the second method, channeling angular scans are used to directly measure the lattice strain by the shift in the <110 crystal direction in the top layer relative to the average <110 direction. These results demonstrate the validity of the strain accommodation model for the interpretation of the dechanneling and indicate that GaAs/sub x/P/sub 1-x//GAP SLS structures of high crystalline quality can be obtained with strain somewhat lower than that predicted theoretically from bulk lattice properties. DOE

N84-14953# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ANNEALING OF INTERSTITIAL LOOPS IN ARSENIC IMPLANTED SILICON
N. R. Wu, P. Ling, D. K. Sadana, J. Washburn, and M. I. Current (Trilogy, Cupertino, Calif.) May 1983 13 p refs Presented at 163rd Electrochem. Soc. Meeting, San Francisco, 8 May 1983 Revised
(Contract DE-AC03-76SF-00098)
(DE84-000384; LBL-15491-Rev; CONF-830508-4-Rev) Avail: NTIS HC A02/MF A01

The annealing effect of different gas ambient (N2 or O2) on high dose As-ion implanted Si wafer was investigated by transmission electronic microscope. A two layer defect structure is observed. The lower layer defects are interstitial type and attributed to the amorphous island below original crystalline amorphous interface. The upper layer loops are As precipitation in the form of stacking fault. The growth/shrinkage rate of interstitial loops during neutral and oxygen annealing are compared and shown interstitial silicons are injected into bulk silicon during oxidation. DOE

N84-14954# Sandia Labs., Albuquerque, N. Mex.
ENERGY RELEASE AND TRANSFORMATION OF SHOCK-MODIFIED ZIRCONIA UPON ANNEALING TO 1550 DEG C
W. F. Hammetter, J. R. Hellmann, R. A. Graham, and B. Morosin 1983 8 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-017801; SAND-83-0804C; CONF-830719-52) Avail: NTIS HC A02/MF A01

Shock modified powder samples were studied in DTA measurements to 1550 C to determine the influence of shock modification on energy release and on the monoclinic to tetragonal transformation. Energy release over that of control samples is observed to begin at appox. 200 C and continues to the onset of the transformation. The phase transformation temperature is at approx. 1170 C and is unaffected by shock loading pressure up to 16 GPa. Above that pressure, the transformation temperature is lowered as pressure increases. The decrease in temperature correlates with both the decrease in crystallite size and retention of the tetragonal phase indicated by X-ray diffraction. DOE

N84-14955# Sandia Labs., Albuquerque, N. Mex.
X-RAY DIFFRACTION LINE-BROADENING STUDIES ON SHOCK-LOADED TIO-2 AND Al2O-3
B. Morosin and R. A. Graham 1983 9 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18 Jul. 1983
(Contract DE-AC04-76DP-00789)
(DE83-016161; SAND-83-1429C; CONF-830719-35) Avail: NTIS HC A02/MF A01

Rutile and alumina powder samples were cold pressed into compacts of about 50% crystal density, subjected to controlled shock loading with peak pressures in the powders between 4 and 27 GPa, and preserved for post shock study. The broadened X-ray diffraction peak profiles were evaluated to determine residual lattice strain and coherent crystallite sizes. Rutile shows residual strain values near 2 x 10(-3) with values for alumina near 4.5 x 10(-3) at peak shock loading pressures of 20 to 27 GPa. Coherent crystallite size reduction is found; in particular, for alumina, size appears to decrease linearly with pressure. Annealing studies on shock loaded rutile show a gradual decrease in strain and increase in crystallite size with temperature. Effects of crystalline anisotropy are noted. DOE

N84-14956# California Univ., Livermore. Lawrence Livermore Lab. Theoretical Atomic and Molecular Physics Group.

LOCALIZED HOLE EFFECTS IN INNER-SHELL EXCITATION

T. N. Rescigno and A. E. Orel 14 Oct. 1983 7 p refs Presented at the Intern. Symp. on Wavefunctions and Mech. from Electron Scattering Processes, Castelgandolfo, Italy, 24-26 Jul. 1983
(Contract W-7405-eng-48)
(DE84-001401; UCRL-89447; CONF-8307103-1) Avail: NTIS HC A02/MF A01

Ab initio calculations of valence shell ionization potentials have shown that orbital relaxation and correlation differences usually make contributions of comparable magnitude. In marked contrast to this observation is the situation for deep core ionization, where correlation differences (approx. 1 eV) play a relatively minor role compared to orbital relaxation (approx. 20 eV). Theoretical calculations have shown that this relaxation is most easily described if the 1s-vacancy created by a K-shell excitation is allowed to localize on one of the atomic centers. For molecules possessing a center of inversion, this means that the molecular orbitals that best describe the final state do not transform as any irreducible representation of the molecular point group. Further calculations on N2, as well as analogous investigations of 1s/sub N/ (FEMALE) (LC OMEGA)* excitation in NO and N2O were examined. The generalized oscillator strengths display a striking similarity and point to the essential correctness of the localized hole picture for N2. DOE

N84-14957# Minnesota Univ., Minneapolis. School of Physics and Astronomy.

FAR-INFRARED STUDIES ON SUPERCONDUCTORS AND HEAT-CAPACITY STUDIES ON LIQUID CRYSTALS Final Report

Cheng-Cher Huang 15 Sep. 1983 14 p refs
(Contract DE-AC02-79ER-10461)
(DE84-001123; DOE/ER-10461/10) Avail: NTIS HC A02/MF A01

Low temperature ($2.6\ K < T < 30\ K$) heat-capacity measurements on one transforming V3Si sample show that the electronic heat capacity in the superconducting state is well characterized by the weak-coupling Bardeen-Cooper-Schrieffer theory. Preliminary characterization of one doped (3)He-cooled-Ge-bolometer for far infrared radiation gave resistance approx. = 3 million (LAMBDA) and sensitivity approx. - 1 million V/W at 0.43 K. Finally, one quasi-adiabatic calorimeter with high resolution and versatility was built for studying phase transitions between the mesophases in liquid crystals which have low thermal conductivity. Heat-capacity studies were carried out in two important continuous phase transitions, i.e., smectic A (SmA) - hexatic B and SmA smectic C (SmC). A phase with hexatic type of ordering was first found in one liquid crystal mesophase, i.e., hexatic B. Unfortunately results on the continuous SmA-hexatic B transition lead to large critical exponents associated with heat capacity anomaly and cannot be explained by the existing theories. On the other hand, results on one continuous SmA-SmC transition indicated the importance of retaining sixth order in the mean-field Landau free energy expansion. Observation resolves many controversial conclusions related to the nature of SmA-SmC transition. DOE

N84-14958# Los Alamos Scientific Lab., N. Mex.

CALCULATION OF STRUCTURES AND MAGNETIC ORIENTATIONS IN SOLID ALPHA- AND BETA-O-2 AS A FUNCTION OF PRESSURE

R. D. Etters, A. Helmy (Colorado State Univ., Fort Collins), and K. Kobashi (Colorado State Univ., Fort Collins) 1983 7 p refs Presented at the 9th AIRAPT Conf., Albany, N.Y., 24-29 Jul. 1983
(Contract W-7405-eng-36)
(DE83-015215; LA-UR-83-2241; CONF-830763-5) Avail: NTIS HC A02/MF A01

An optimization method is coupled with a harmonic lattice dynamics approximation to determine the minimum energy structures and magnetic orientations of solid O2. The magnetic interaction is responsible for the stability of (-)-O2 with respect to (ALPHA)-O2 at zero temperature and pressure. The calculated (-)-O2 lattice parameters, magnetic orientations, and sublimation energy are in good agreement with experiment. Phonon dispersion curves are calculated and the acoustic sound velocities are determined. The (ALPHA)-O2 phase is described by constraining the magnetic moments so that the magnetic Hamiltonian preserves the hexagonal symmetry of the crystal. The calculated lattice parameters are in good agreement with experiment and a three sublattice, quasi-helical magnetic orientation is predicted from structural and energetic considerations. A soft mode induced phase transition from the monoclinic (-) structure to the orthorhombic orange oxygen structure is predicted at approximately 6 kbar. DOE

N84-14959# Argonne National Lab., Ill. Materials Science and Technology Div.

LATTICE DYNAMICS OF THE MIXED-CONDUCTING INTERMETALLIC COMPOUND ALPHA-LiAl

T. O. Brun, J. E. Robinson, S. Susman, D. F. R. Mildner (Missouri Univ., Columbia), R. Dejus (Studsvik Science Research Lab., Nykoeping, Sweden), and K. Skoeld (Studsvik Science Research Lab., Nykoeping, Sweden) Apr. 1983 4 p refs Presented at the 4th Intern. Conf. on Solid State Ionics, Grenoble, France, 4-8 Jul. 1983
(Contract W-31-109-eng-38)
(DE83-014334; CONF-830708-3) Avail: NTIS HC A02/MF A01

The intermetallic compound, (ALPHA)-LiAl, that crystallizes in the uncommon Zintl structure is a mixed-conducting electrode and has many unusual properties pointing to the existence of unusual bonding in the semi-metallic compounds. In order to elucidate the nature of the bonding in LiAl, the lattice dynamics of (ALPHA)-LiAl by inelastic neutron scattering was studied. Results for the phonon dispersion curves were obtained for the principal symmetry directions. A force constant fit to the results indicates that the Al-Al force constants are unusually large. Pair potentials were constructed by conventional pseudopotential calculations. The pair interactions favoring the Zintl structure were used to compute phonon dispersion curves. Good agreement between theory and experiment can be obtained for the acoustic branches. DOE

N84-14960# Los Alamos Scientific Lab., N. Mex.

PREDICTION OF PRESSURE INDUCED STRUCTURAL PHASE TRANSITIONS AND INTERNAL MODE FREQUENCY CHANGES IN SOLID N2+

R. D. Etters, K. Kobashi, and V. Chandrasekharan 1983 5 p refs Presented at the Am. Phys. Soc. Meeting on Shock Waves in Condensed Media, Santa Fe, N. Mex., 18-21 Jul. 1983
(Contract W-7405-eng-36)
(DE83-014279; LA-UR-83-2146; CONF-830719-18) Avail: NTIS HC A02/MF A01

A rhombohedral distortion of the Pm3n structure is introduced which shows that a low temperature phase transition occurs from P4(2)/mnm into the R3c calcite structure at P approx. = 19.2 kbar with a volume change of 0.125 cm(3)/mole. This transition agrees with recent Raman scattering measurements. Another transition from R3c into R3m is predicted at P approx. = 67.5 kbar, with a volume change of 0.1 cm(3)/mole. The pressure dependence of the intramolecular mode frequencies for the R3c structure is in reasonably good agreement with the two main branches observed experimentally. DOE

N84-14961 California Inst. of Tech., Pasadena.

MICROWAVE DYNAMICS OF QUASIPARTICLES AND CRITICAL FIELDS IN SUPERCONDUCTING FILMS Ph.D. Thesis

Srinivas Sridhar 1983 146 p
Avail: Univ. Microfilms Order No. DA8315858

The microwave response of the superconducting state in equilibrium and non-equilibrium configurations was examined experimentally and analytically. Thin film superconductors were mostly studied in order to explore spatial effects. The response parameter measured was the surface impedance. For small microwave intensity the surface impedance at 10 GHz was measured for a variety of samples (mostly Sn) over a wide range of sample thickness and temperature. A detailed analysis based on the BCS theory was developed for calculating the surface impedance for general thickness and other experimental parameters. Experiment and theory agreed with each other to within the experimental accuracy. Thus it was established that the samples, thin films as well as bulk, were well characterized at low microwave powers (near equilibrium). Dissert. Abstr.

N84-14962 Wisconsin Univ., Madison.
MICROSCOPIC STUDY OF SEMICONDUCTOR HETEROJUNCTIONS Ph.D. Thesis
Ahmad Daoud Katnani 1983 132 p
Avail: Univ. Microfilms Order No. DA8315009

The results of the systematic investigation of band discontinuity at semiconductor-semiconductor interfaces are presented. The investigation involved synchrotron-radiation photoemission measurements of the valence band discontinuity for 25 different interfaces involving group IV, III-V and II-VI semiconductor substrates and Ge or Si overlayers. The results and the theoretical predictions revealed an underlying general accuracy limit, 0.15 eV, of all current general discontinuity models. Furthermore, a comparison between the results and the predictions of each model revealed that none of them achieve the above accuracy limit. The best agreement was found with empirically corrected versions of the models of Harrison and of Frensley and Kroemer. The data were used to develop a new empirical rule yielding even more accurate predictions of the band discontinuities. Besides investigating the band discontinuity, the Fermi level pinning position was also measured. The measured pinning position of each substrate is the same for both Ge and Si overlayers. This result is discussed in terms of the defect model of Fermi-level pinning, originally developed for Schottky barriers. Dissert. Abstr.

N84-14963 Colorado State Univ., Fort Collins.
HIGH PRESSURE PROPERTIES OF SOLID ALPHA OXYGEN Ph.D. Thesis
Abdelrahman Ahmed Helmy 1983 71 p
Avail: Univ. Microfilms Order No. DA8317800

An atom-atom 6-exponential O2-O2 potential is constructed from gas data and magnetic susceptibility measurements. A quasi-harmonic lattice dynamics method coupled with a pattern search optimization scheme is used to determine the minimum energy structure at each volume. Based upon this potential the thermodynamic, spectral, magnetic, and structural properties of alpha-O2 under high pressure are studied. It is shown that the magnetic interaction is responsible for the stability of alpha-O2 with respect to beta-O2 at zero temperature and pressure. Also, a pressure induced phase transition to an orthorhombic structure at about 6 kbar is indicated. It is suggested that this transition is driven by a soft shear acoustic mode propagating along a (001) and polarized along a (100) crystal direction. Dissert. Abstr.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-14964# Committee on Science and Technology (U. S. House).
NASA'S FIVE-YEAR PLAN
Washington GPO 1983 169 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 38, 26; 28 Jul. 1983
(GPO-27-459) Avail: Subcommittee on Space Science and Applications

The long range goals of NASA and how they fulfill national policy as established in the 1958 National Aeronautics and Space Act are reviewed. Specific plans for the next five years in the space flight, space technology, space science and applications, and space tracking and data systems programs are examined. A.R.H.

N84-14965*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROJECT MANAGEMENT TECHNIQUES FOR HIGHLY INTEGRATED PROGRAMS
James F. Stewart and Carol A. Bauer Dec. 1983 13 p refs Presented at the 2nd Flight Test Conf., Las Vegas, Nev., 16-18 Nov. 1983
(NASA-TM-86023; H-1211; NAS 1.15:86023) Avail: NTIS HC A02/MF A01 CSCL 05A

The management and control of a representative, highly integrated high-technology project, in the X-29A aircraft flight test project is addressed. The X-29A research aircraft required the development and integration of eight distinct technologies in one aircraft. The project management system developed for the X-29A flight test program focuses on the dynamic interactions and the the intercommunication among components of the system. The insights gained from the new conceptual framework permitted subordination of departments to more functional units of decision-making, information processing, and communication networks. These processes were used to develop a project management system for the X-29A around the information flows that minimized the effects inherent in sampled-data systems and exploited the closed-loop multivariable nature of highly integrated projects. Author

N84-14966# Naval Postgraduate School, Monterey, Calif.
A CALCULATOR ADAPTATION OF THE MARKOV CHAIN MODEL FOR MANPOWER ANALYSIS M.S. Thesis
Jeffrey Kendall Sapp Jun. 1983 114 p
(AD-A132990) Avail: NTIS HC A06/MF A01 CSCL 05/9

This thesis provides a foundation for the application of fundamental Markov analysis to manpower modeling in the Armed Services or in other similar organizations. A handheld calculator software package is introduced to assist students, military analysts, and others who model manpower systems. Markov analysis methods are incorporated in program software to permit discrete time investigation of the Navy's manpower structure. A user program guide for application to a broad range of manpower issues is also presented. Author (GRA)

N84-14967# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LIFE CYCLE COSTING IN A DYNAMIC ENVIRONMENT Ph.D. Thesis
John Amos Long 1983 202 p
(AD-A133023; AFIT/CI/NR-83-26D) Avail: NTIS HC A10/MF A01 CSCL 05/1

The consideration of life cycle cost is a major part of the Department of Defense management strategy to control the increasing cost of defense systems. It includes the cost of research and development, production, operating and support, and disposal. Unfortunately, due to a lack of credibility, life cycle costing has not reached its full potential. In an attempt to rectify the situation, this research centers on life cycle costing in a dynamic environment. This examination is from the three perspectives: methodology, modeling, and application. The chapter on methodology is a critical examination of Air Force life cycle costing in the acquisition of new aeronautical systems. It contains recommendations for reorganization and revision of current business practices. The chapter on modeling reviews various models and methods for risk analysis including Monte Carlo simulations, additive and multiplicative moments, sums and products of random variables, and transform techniques. The chapter on application demonstrates the feasibility of using the various models and methods under a realistic scenario for systems acquisition. GRA

N84-14968# Oak Ridge Y-12 Plant, Tenn.
INTERACT EXECUTE FACILITY FOR JOB SCHEDULING AND MANIPULATION
J. T. Moore Oct. 1983 65 p Presented at the Cullinet User's Week, New Orleans, 3 Oct. 1983
(Contract W-7405-eng-26)
(DE84-001190; Y/CSD/INF-83/3; CONF-8310190-1) Avail: NTIS HC A04/MF A01

The INTERACT's execute facility and command set which provide a very obvious and simple mechanism for computerizing the computer operations department are outlined. A production oriented shop has a large volume of batch jobs that are submitted on a regular schedule and these jobs are usually grouped into systems. Furthermore, within these systems, individual jobs that are related, if not dependent on each other, sometimes have to run in a particular sequence. It's usually the responsibility of a setup group within the computer operations department to see that these jobs are submitted on schedule, the results are checked, a predefined procedure is followed when things go wrong, and reports are distributed to appropriate people out in the field. An online system, the JES3 NETWORK MANAGER, using INTERACT and its execute facility to handle these functions is presented. DOE

N84-14969# Los Alamos Scientific Lab., N. Mex.
BENCHMARKING UNSTRUCTURED SYSTEMS
L. Brice, J. Connell, and G. Lockhart 1983 13 p refs Presented at CHI 1983 Conf., Cambridge, Mass., 12 Dec. 1983
(Contract W-7405-eng-36)
(DE83-011175; LA-UR-83-1207; CONF-831202-1) Avail: NTIS HC A02/MF A01

Systems developed without the advantage of structured techniques are discussed. When an unstructured system is identified, management must decide if it should be rewritten according to modern standards. Management decision making in one data processing shop is described. To be judged successful, a system should be friendly, useful and easily maintainable. It is shown that psychologically complex programs are more expensive to maintain than those developed with structured techniques, free from such complexity. Three suspect systems were statistically measured against a base system. When a suspect system proved at least as psychologically complex as the base system, future maintenance costs were assumed to be at least as high as for the benchmark system. The study provided management with a more accurate view of programmer work habits. Programmers previously judged to be extremely competent created a high level of psychological complexity which is expected to result in high maintenance costs when other programmers become responsible for the system. DOE

N84-14970# Federal Coordinating Council for Science, Engineering and Technology, Washington, D. C. Committee on Materials.
INVENTORY OF FEDERAL MATERIALS RESEARCH AND TECHNOLOGY, FISCAL YEAR 1982
Jun. 1983 49 p
(PB83-256610) Avail: NTIS HC A03/MF A01 CSCL 05A

The Committee on Materials' first task has been to produce an inventory of materials research and technology which would be useful for interagency coordination and for assessing the federal program in terms of national needs and objectives. A breakdown is presented of the areas in which funds are spent within each agency to sub-activity levels and each agency's materials programs and activities are briefly described. A proposed classification system for detailing the research activities is included. Author (GRA)

N84-14971# Northeastern Univ., Boston, Mass. College of Business Administration.
FACTORS EXPLAINING DECISIONS TO TERMINATE OR CONTINUE AN R AND D PROJECT, EXECUTIVE SUMMARY Final Report
Ramaiya Balachandra and Joseph A. Raelin May 1983 9 p 2 Vol.
(Grant NSF ISI-81-05585)
(PB83-256602; NSF/ISTI/PIR-81-05585-1) Avail: NTIS HC A02/MF A01 CSCL 05J

The study was designed to identify and evaluate critical factors underlying decisions to continue or terminate R&D or development projects in private firms after appreciate amounts of investment funds have been expended in those projects. The first part of the study entails a search to identify, reduce, and operationalize both environmental factors (such as government regulations and procurement activities; actions by major consumer groups; and the degree of product competition) and organizational factors (such as degree of support from top management and R&D management or the presence of a project champion) and to account for the influence of these factors separately from the influence of project specific factors (such as the probabilities for technical and commercial success, expected profits after commercialization occurs, and expected capital requirements). Author (GRA)

N84-14972# Northeastern Univ., Boston, Mass. College of Business Administration.
FACTORS EXPLAINING DECISIONS TO TERMINATE OR CONTINUE AN R AND D PROJECT Final Report
Ramaiya Balachandra and Joseph A. Raelin (Boston College) May 1983 268 p refs 2 Vol.
(Grant NSF ISI-81-05585)
(PB83-256594; ISTI/PIR-81-05585-2) Avail: NTIS HC A12/MF A01 CSCL 05J

This study has identified a set of factors which explains the decisions to terminate or continue commercial R&D projects. From a wide cross section of industry in the United States, 114 commercial R&D projects were studied. The resulting model was able to classify the projects into two groups (terminated and successfully completed) with a high degree of accuracy (92% correct classification) using only 14 variables. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-14973*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RESEARCH AND TECHNOLOGY AT THE LYNDON B. JOHNSON SPACE CENTER Annual Report for 1983
Nov. 1983 98 p refs
(NASA-TM-58257; S-531; NAS 1.15:58257) Avail: NTIS HC A05/MF A01 CSCL 05B

Johnson Space Center accomplishments in new and advanced concepts during 1983 are highlighted. Included are research funded by the Office of Aeronautics and Space Technology; Advanced Programs tasks funded by the Office of Space Flight; and Solar System Explorations, Life Sciences, and Earth Sciences and Applications research funded by the Office of Space Sciences and Applications. Summary sections describing the role of the Johnson Space Center in each program are followed by one-page descriptions of significant projects. Descriptions are suitable for external consumption, free of technical jargon, and illustrated to increase ease of comprehension. Author

N84-14974*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FY 1983 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS AND PRESENTATIONS
Sarah S. Thacker, comp. Nov. 1983 55 p
(NASA-TM-82547; NAS 1.15:82547) Avail: NTIS HC A04/MF A01 CSCL 05B

Formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 83 are presented. Papers of MSFC contractors are included. Author

N84-14975*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
RESEARCH AND TECHNOLOGY AT THE KENNEDY SPACE CENTER Annual Report for 1983
Nov. 1983 43 p
(NASA-TM-83092; NAS 1.15:83092) Avail: NTIS HC A03/MF A01 CSCL 05B

Cryogenic engineering, hypergolic engineering, hazardous warning, structures and mechanics, computer sciences, communications, meteorology, technology applications, safety engineering, materials analysis, biomedicine, and engineering management and training aids research are reviewed. N.W.

N84-14976# Naval Research Lab., Washington, D. C.
A COMPREHENSIVE DESCRIPTION OF THE MISSION SENSOR MICROWAVE IMAGER (SSM/I) ENVIRONMENTAL PARAMETER EXTRACTION ALGORITHM
R. C. Lo 30 Sep. 1983 57 p
(AD-A134052; NRL-MR-5199) Avail: NTIS HC A04/MF A01 CSCL 12/1

The Mission Sensor Microwave/Imager (SSM/I) is a passive microwave radiometric system designed to provide retrievals of the environmental parameters including sea surface wind, precipitation, atmospheric moisture content, soil moisture and sea ice conditions. It is a joint Navy/Air Force project developed by Hughes Aircraft Company under the direction of the Navy Space Systems Activity (NSSA) and the Air Force Space Division to be flown on the Defense Meteorological Satellite Program. The Space Sensing Applications Branch of the Naval Research Laboratory has served as a technical consultant to NSSA beginning in fiscal year 1982. Description of the environmental parameter retrieval technique, the geophysical model, the radiative transfer model and the parameter retrieval algorithms are presented. This information is designed to provide a comprehensive view of the SSM/I environmental parameter extraction algorithm for those individuals who have an interest in the geophysical data products from the SSM/I. GRA

N84-14977# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 37, NUMBER 8 Monthly Report
Ronald W. Armstrong and Larry E. Shaffer 31 Aug. 1983 57 p
(AD-A133938; ESN-37-8) Avail: NTIS HC A04/MF A01 CSCL 05/2

Partial contents: Small Firms--Growth and Jobs?; High Polymers as Thin Films; Robotics at ASEA; Software Systems Research at Linkping Institute of Technology; and European Microwave Semiconductor Devices Conference. GRA

N84-14978# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 60, JULY AUGUST 1982
15 Jul. 1983 129 p
(AD-A133932; DIA-DST-2700Z-006-83) Avail: NTIS HC A07/MF A01 CSCL 05/2

This is the Soviet Laser Bibliography for July-August 1982, and is No. 60 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

N84-14979# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 37, NUMBER 7 Monthly Report
David Mosher and Larry E. Shaffer 31 Jul. 1983 59 p
(AD-A132676; ESN-37-7) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European Science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists traveling in Europe may also be invited to author an ESN article. Author (GRA)

N84-14980# Naval Postgraduate School, Monterey, Calif.
THE DETERMINATION OF USER INFORMATION REQUIREMENTS DURING THE DEVELOPMENT OF MANAGEMENT INFORMATION SYSTEMS M.S. Thesis
Paul Richard Gardella, Jr. Jun. 1983 137 p
(AD-A132998) Avail: NTIS HC A07/MF A01 CSCL 05/2

One of the major causes for the failure of Management Information Systems (MIS) is that these do not satisfy the user's information requirements. This, in turn, is most often caused by the fact that those requirements are difficult to obtain accurately and completely. Simply asking the user what he needs is inadequate. This thesis reviews the Information Requirements Analysis literature, briefly describing some of the techniques available for determining the users' information requirements. It then reports on a survey which attempted to investigate the degree to which the extensive MIS literature involving information requirements determination has had practical impact on the way in which MIS's are actually developed. Author (GRA)

N84-14981# Pacific Northwest Lab., Richland, Wash.
DATA DICTIONARY MODEL FOR RELATIONAL DATABASES
Paul R. Seesing Oct. 1983 21 p refs Presented at the US Fall DECUS Symp., Las Vegas, Nev., 24-28 Oct. 1983
(Contract DE-AC06-76RL-01830)
(DE84-002584; PNL-SA-11715; CONF-8310182-2) Avail: NTIS HC A02/MF A01

Data dictionary is an important tool in information engineering, especially when the data are maintained in relational structures. Using the formal concepts from which relational DBMS technology is derived, it is possible to construct a metainformational dictionary to model relational data base. This general model can be used to evaluate the design of existing and planned data bases, as well as modeling business or scientific data. Issues related to the balancing of such formal conceptualization against real world operations are presented. DOE

N84-14982# California Univ., Berkeley. Lawrence Berkeley Lab. Magnetic Measurements Engineering Group.
GENERAL PURPOSE MAGNETIC-MEASUREMENT DATA-ACQUISITION SYSTEM
M. I. Green and D. H. Nelson Aug. 1983 10 p refs Presented at the 8th Intern. Conf. on Magnet Technol. and Exhibition, Grenoble, France, 5-9 Sep. 1983
(Contract DE-AC03-76SF-00098)

(DE84-001101; LBL-158652; CONF-830971-6) Avail: NTIS HC A02/MF A01

A real time data acquisition system (DAS) for magnetic measurements was developed. A system that is versatile, portable, modular, expandable, maintable, quickly and easily reconfigurable both in hardware and software was designed. An LSI 11/23 microcomputer is interfaced to a clock calendar, printer, CRT control terminals, plotter with hard copy, floppy and hard disks, GPIB, and CAMAC buses. Operational capabilities include: (1) measurement of high permeability materials; (2) harmonic error analysis of superconducting dipoles and rare earth cobalt (REC) and conventional quadrupole magnets; and (3) 0.1% accuracy x-y mapping with Hall probes. The DAS capabilities, some of the special instrumentation developed to implement these capabilities, and some planned developments are described. DOE

N84-14983# Pacific Northwest Lab., Richland, Wash.

ALDS PROJECT: MOTIVATION, STATISTICAL DATABASE MANAGEMENT ISSUES, PERSPECTIVES, AND DIRECTIONS

James J. Thomas and David L. Hall Sep. 1983 8 p refs Presented at the 2nd Intern. Statistical Database Management Workshop, Los Altos, Calif., 27-29 Sep. 1983

(Contract DE-AC06-76RL-01830)

(DE84-001412; PNL-SA-11513; CONF-830950-1) Avail: NTIS HC A02/MF A01

A new direction in the analysis of large data sets was established. The ALDS project is composed of a team of statisticians and computer scientists. The motivation and initial goals of the ALDS project, the impact of large data sets, the data management issues addressed by ALDS, current research tasks and their impact on statistical data base management, and perspectives is discussed. DOE

N84-14984# Oak Ridge Gaseous Diffusion Plant, Tenn.

MANAGEMENT INFORMATION SYSTEM FOR ENGINEERING

R. O. Green, J. M. Morrison, and R. H. Wantland 30 Aug. 1983 13 p Presented at the Am. Soc. for Eng. Management Ann. Meeting, Washington, D.C., 17 Oct. 1983

(Contract W-7405-eng-26)

(DE84-001655; K/D-544; CONF-8310131-2) Avail: NTIS HC A02/MF A01

The engineering management information system (EMIS) is a computer based information system that integrates business management systems. System scope includes engineering work load, forecasting, cost, schedule, and selected administrative information. The EMIS was developed to provide a single source of current, official data. It is structured to meet a wide variety of needs, such as facilitating both uniform support of project management requirements associated with the uniquely different missions of the plants and control of the day to day operations of the engineering organization. DOE

N84-14985# Patent and Trademark Office, Washington, D. C. Office of Technology Assessment and Forecast.

DESIGN PATENTS

Oct. 1983 261 p

(PB83-224063) Avail: NTIS HC $15.50/MF A01 CSCL 05B

In a continuing effort to provide useful information about every aspect of the U.S. patent file, the Office of Technology Assessment and Forecast (OTAF) has gathered all available statistics about U.S. design patents granted between 1842 and 1982. In addition to a brief explanation of design patents, this publication analyzes trends and identifies the origins and ownership of design patents. OTAF has examined in detail design patents granted between 1977 and 1982, identified design areas of highest activity, and profiled major divisions within the design patent file. The first section of the report discusses the history of design patenting in the United States, describes the contents of a design patent, and shows the major divisions of subject matter within the Design Patent Classification System. Author (GRA)

N84-14986 University of Central Florida, Orlando.

AN ANALYTICAL MODEL FOR EVALUATING DATABASE UPDATE SCHEMES Ph.D. Thesis

Kathryn Coke Kinsley 1983 190 p

Avail: Univ. Microfilms Order No. DA8316436

A methodology is presented for evaluating the performance of database update schemes. The methodology uses the M/Hr/1 queueing model as a basis for this analysis and makes use of the history of how data is used in the database. Parameters have been introduced which can be set based on the characteristics of a specific system. These include update to retrieval ratio, average file size, overhead, block size and the expected number of items in the database. The analysis is specifically directed toward the support of derived data within the relational model. Three support methods are analyzed. These are first examined in a central database system. The analysis is then extended in order to measure performance in a distributed system. Because concurrency is a major problem in a distributive system, the support of derived data is analyzed with respect to three distributive concurrency control techniques--master/slave, distributed and synchronized. Dissert. Abstr.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-14987# Wisconsin Univ., Madison. Mathematics Research Center.

KEYNESIAN CHAOS

Richard H. Day and Wayne Shafer Jul. 1983 46 p Presented at the Dynamical Systems Seminar

(Contract DAAG29-80-C-0041)

(AD-A132836; MRC-TSR-2544) Avail: NTIS HC A03/MF A01 CSCL 05/3

This paper shows how chaotic fluctuations can emerge in a dynamic version of the standard fixprice macroeconomic model. The crucial parameters involved induced investment and its sensitivity to interest rates. We use some ideas from the theory of chaos and from ergodic theory to illustrate the fact that apparently random trajectories need not be rare. The paper concludes with some tantalizing hints at how insights on monetary theory and policy might change when comparative dynamics rather than comparative statics are used and when nonlinearities of the kind illustrated in the paper prevail. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-14988 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.

COST PROBLEMS IN INTERNATIONAL COLLABORATION [KOSTENPROBLEME BEI INTERNATIONALER ZUSAMMENARBEIT]

Josef Schwendner 15 Jan. 1982 15 p In GERMAN

(MBB-UA-671-82-Oe) Copyright. Avail: Issuing Activity

International competition is treated, including currency parity and parity changes, calculation schemes, wages level in the Federal Republic of Germany, comparison of hourly rates, efficiency, fixing of quotas, dumping, and economic criteria. International collaboration (national projects in comparison with international projects, work sharing, and the case of US supply) is discussed. Costs and financing problems in international collaboration are presented, including contract currency, fixed contract prices, currency risks and insurance, foreign exchange control, balance assessment problems, present practice. Author (ESA)

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-14989*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DOWNSIZING ASSESSMENT OF AUTOMOTIVE STIRLING ENGINES Final Report
Richard H. Knoll, Roy C. Tew, Jr., and John L. Klann Sep. 1983 42 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-83468; E-1783; NAS 1.15:83468; NASA/DOE/51040-49) Avail: NTIS HC A03/MF A01 CSCL 13F

A 67 kW (90 hp) Stirling engine design, sized for use in a 1984 1440 kg (3170 lb) automobile was the focal point for developing automotive Stirling engine technology. Since recent trends are towards lighter vehicles, an assessment was made of the applicability of the Stirling technology being developed for smaller, lower power engines. Using both the Philips scaling laws and a Lewis Research Center (Lewis) Stirling engine performance code, dimensional and performance characteristics were determined for a 26 kW (35 hp) and a 37 kW (50 hp) engine for use in a nominal 907 kg (2000 lb) vehicle. Key engine elements were sized and stressed and mechanical layouts were made to ensure mechanical fit and integrity of the engines. Fuel economy estimates indicated that the Stirling engine would maintain a 30 to 45 percent fuel economy advantage comparable spark ignition and diesel powered vehicles in the 1984 period. Author

N84-14990*# California Polytechnic State Univ., San Luis Obispo.
A PRELIMINARY INVESTIGATION OF THE DRAG AND VENTILATION CHARACTERISTICS OF LIVESTOCK HAULERS Contractor Final Report
J. A. Hoffman and D. R. Sandin Dec. 1983 83 p refs
(Contract NAG4-7)
(NASA-CR-170408; NAS 1.26:170408) Avail: NTIS HC A05/MF A01 CSCL 13F

A wind tunnel evaluation of the drag and ventilation characteristics of a conventional (unmodified) and five modified subscale model livestock haulers at 0 deg yaw angle has been made. The unmodified livestock hauler has a relatively high drag coefficient, and a low velocity recirculation region exists in the forward portion of the hauler. The use of a streamlined forebody and enclosed gap reduced the drag coefficient of one model by 42% and improved the rate at which contaminants can be flushed from the cargo compartment by a factor of 2.5. From the limited data obtained, any increase in the fraction of open area of the trailer sides was found to improve the trailer ventilation. The use of a ram air inlet can improve the ventilation within the hauler and remove the low velocity recirculation region at the expense of a modest increase in the truck's drag coefficient. A mathematical model for vehicles with ram air or NACA submerged inlets was developed and appears to adequately predict the ventilation characteristics of livestock haulers. B.W.

N84-14991*# Little (Arthur D.), Inc., Cambridge, Mass.
CATALOG OF SELECTED HEAVY DUTY TRANSPORT ENERGY MANAGEMENT MODELS Contractor Report, Dec. 1982 - Nov. 1983
Ralph G. Colello, Ashok B. Boghani, Nancy C. Gardella, Philip G. Gott, W. David Lee, Edward C. Pollak, William P. Teagan, Richard G. Thomas, Carla M. Snyder, and Robert P. Wilson, Jr. Nov. 1983 277 p
(Contract DEN3-301)
(NASA-CR-168299; DOE/NASA-0301/1; NAS 1.26:168299; ADL-88683) Avail: NTIS HC A17/MF A01 CSCL 13F

A catalog of energy management models for heavy duty transport systems powered by diesel engines is presented. The catalog results from a literature survey, supplemented by telephone interviews and mailed questionnaires to discover the major computer models currently used in the transportation industry in the following categories: heavy duty transport systems, which consist of highway (vehicle simulation), marine (ship simulation), rail (locomotive simulation), and pipeline (pumping station simulation); and heavy duty diesel engines, which involve models that match the intake/exhaust system to the engine, fuel efficiency, emissions, combustion chamber shape, fuel injection system, heat transfer, intake/exhaust system, operating performance, and waste heat utilization devices, i.e., turbocharger, bottoming cycle. Author

N84-14992# Argonne National Lab., Ill.
MEASURING ENERGY USE IN URBAN TRAVEL USING A SKETCH PLANNING MODEL
M. Kaplan, S. LaBelle, and C. Saricks 1983 25 p refs Presented at 24th Ann. Meeting of Transport. Res. Forum, Crystal City, Va., 2 Nov. 1983
(Contract W-31-109-eng-38)
(DE83-015375; CONF-831160-2) Avail: NTIS HC A02/MF A01

An innovative approach to modeling transportation energy demand in metropolitan areas was developed. A sketch planning travel demand model (called SRGP) was joined with an autoownership model, a fitting technique for demographic forecasts, and an algorithm to assign origin/destination travel to the intervening districts. Forecasts for three typical cities indicate a large potential for saving energy relying on automotive fuel economy improvements and rising fuel prices, without detrimental effects or urban mobility. Fuel saving potential varies by type of city, with rapidly growing metropolitan areas unlikely to stay below 1980 fuel use unless population growth occurs in more established, transit oriented cities. Diesel fuel use may continue to rise after 1990, depending directly on the strength of the economy and inversely on the success of competing, spark ignition/gasoline fueled automobiles. DOE

88 SPACE SCIENCES (GENERAL)

N84-14993# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
[ACTIVITIES IN INTERPLANETARY SPACE PHYSICS] Annual Report, 1981 [RELAZIONE SULL'ATTIVITA' SVOLTA NELL'ANNO 1981]
May 1962 53 p refs In ITALIAN
(IFSI-82-7) Avail: NTIS HC A04/MF A01

Cosmic ray solar wind, Earth magnetosphere gravitational waves, and infrared astronomy research is summarized.
Author (ESA)

N84-14994# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
[DESCRIPTION OF 1982 ACTIVITIES IN INTERPLANETARY PHYSICS] Annual Report, 1983 [RELAZIONE SULL'ATTIVITA' SVOLTA NELL'ANNO 1982]
May 1983 62 p refs In ITALIAN
(IFSI-83-5) Avail: NTIS HC A04/MF A01

Cosmic rays, solar wind, Earth magnetosphere, gravitational waves, and infrared astronomy research is summarized. Interplanetary plasma physics, magnetohydrodynamic turbulence and the structure of the magnetospheric boundaries were studied.
Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-14995 Wisconsin Univ., Madison.
VISIBLE AND INFRARED CONTINUUM SPECTROPOLARIMETRIC OBSERVATIONS OF TEN OB SUPERGIANT AND O EMISSION LINE STARS Ph.D. Thesis
Olivia Lois Lupie 1983 233 p
Avail: Univ. Microfilms Order No. DA8315014

Low resolution optical wavelength spectropolarimetry and infrared filter polarimetry are presented for 10 O and B stars. The sample contains slow and rapid rotators, a range of spectral types, O6 - B2, and two known binaries. The optical data were obtained over a period of 3 years using the Pine Bluff Observing Facility of Washburn Observatory. The infrared data were acquired over the course of two nights with the 1.3 m telescope of Kitt Peak National Observatory. Seven of the ten program stars exhibited random polarimetric fluctuations at the 0.2% - 0.4% level on time scales of several days to months. With the exception of one of the binary stars, the observed position angles varied with time in a way that implies that the intrinsic position angle itself is time dependent. For the majority of the polarimetrically variable stars, the interstellar component dominated the observed polarization vector making the interpretation difficult. In two cases, the intrinsic polarization and position angle were consistent with being constant with wavelength. Dissert. Abstr.

N84-14996 Indiana Univ., Bloomington.
AN X-RAY AND OPTICAL SURVEY OF s-TYPE MARKARIAN GALAXIES Ph.D. Thesis
Donald John Hutter 1983 191 p
Avail: Univ. Microfilms Order No. DA8317117

The results of a study of 23 compact, lineless Markarian galaxies using broadband optical photometry and X-ray satellite observations are reported. In one group are sources in which a BL Lacetae object is embedded in an elliptical galaxy. In the second group are objects which show a small ultraviolet excess relative to normal galaxies. The X-ray survey indicates that the X-ray luminosities of objects in group 2 are much lower than those in group 1. This suggests that there is an intrinsic difference between objects in group 1 and 2. The third and fourth groups are objects whose colors are indistinguishable from those of normal field galaxies and those of galaxtic stars, respectively. No X-ray emission was detected from objects in either of these groups. Dissert Abstr.

N84-14997 California Inst. of Tech., Pasadena.
VISIBLE AND INFRARED STUDIES OF ATACLYSMIC VARIABLE STARS Ph.D. Thesis
Graham Berriman 1983 171 p
Avail: Univ. Microfilms Order No. DA8315841

The visible and infrared (1-2 micrometer) light of fourteen uneclipsing systems is shown to come largely from the red dwarfs and the opaque gas in the accretion disc, with more light coming from the red dwarfs in the longer period systems than in the shorter period ones. A technique to simulate the light curves of tidally distorted red dwarfs successfully accounts for the infrared light curves of U Geminorium, a system in which the red dwarf supplied nearly all the infrared light. The eclipsing dwarf nova micron gamma Carinae was studied in quiescence. An analysis of the visible eclipses of the white dwarf by the red dwarf shows that the inclination of the system is 73.5 to 81 deg, the mass of the white dwarf is 0.4 to 1.4 M solar mass, and the red dwarf lies either on or slightly below the Main Sequence mass radius relation. At J, H and K, the red dwarf supplies one half of the uneclipsed infrared light, and it eclipses more than three fifths of the light of the disc. The K magnitude of the red dwarf is 14.2 to 14.7 and the system is 100 to 300 pc distant. The infrared light of the disc of micro gamma Carinae comes largely from optically thin emission. Dissert. Abstr.

N84-14998# Smithsonian Astrophysical Observatory, Cambridge, Mass. Branch Library.
INFORMATION SOURCES AND SERVICES IN ASTRONOMY, ASTROPHYSICS, AND RELATED SPACE SCIENCES
Joyce M. Rey 1983 35 p
Avail: NTIS HC A03/MF A01

Published abstracts and on-line data bases, data banks and miscellaneous sources, and books are listed. N.W.

N84-14999# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
MEASUREMENT OF ATMOSPHERIC MOISTURE AND EXTINCTION COEFFICIENT IN THE NEAR INFRARED AT CIMA EKAR [MISURE DI ACQUA PRECIPITABILE E DEL COEFFICIENTE DI ESTINZIONE NEL VICINO IR A CIMA EKAR]
D. Lorenzetti, V. Pertile (Osservatorio Astrofisico, Asiago, Italy), P. Saraceno, and F. Strafella (Lecce Univ., Italy) May 1983 12 p refs In ITALIAN
(IFSI-83-6) Avail: NTIS HC A02/MF A01

In order to the evaluate the quality of the sky for infrared astronomy, atmospheric moisture was measured using a spectral hygrometer, which is described. The amount of condensable water at night can be inferred from the day value and meteorological data. The extinction coefficient was measured by observing standard stars at different zeniths and comparing the observed magnitude difference with the intrinsic difference. Tables of atmospheric moisture and extinction coefficients from 1980 to 1983 are included. Author (ESA)

N84-15000 Hawaii Univ., Honolulu.
SPECTRAL REFLECTANCE OF NEAR-EARTH ASTEROIDS: IMPLICATIONS FOR COMPOSITION, ORIGIN AND EVOLUTION Ph.D. Thesis
Lucy-Ann Adams McFadden 1983 218 p
Avail: Univ. Microfilms Order No. DA8319824

The reflectance spectrum (0.33 - 1.0 microns) of 17 near-Earth asteroids were measured telescopically with a photoelectric photometer. Mineralogical interpretation assuming cosmically abundant material is based on crystal field theory. The surface composition of these asteroids (with one exception) contains olivine, pyroxene, phyllosilicates and opaques (which cannot be mineralogically identified). These spectra have stronger absorptions than that of most main belt asteroids. 2201 1947XC cannot be interpreted in terms of common minerals. Cometary emission features may explain the spectrum. Dissert. Abstr.

N84-15001 Ohio State Univ., Columbus.
A STUDY OF MAGNETIC, LINE-BLANKETED MODEL ATMOSPHERES Ph.D. Thesis
Kenneth George Carpenter 1983 118 p
Avail: Univ. Microfilms Order No. DA8318331

Magnetic, line-blanketed model atmospheres for upper main-sequence stars with normal elemental abundances and a slightly distorted dipolar magnetic field were constructed. These were computed with a modified version of the ATLAS6 (Kurucz, 1979) model atmosphere code and newly computed Opacity Distribution Functions (ODF's), which take into account the Zeeman splitting of the contributing atomic lines. The calculation of the magnetic ODF's is described and the results are compared with the original non-magnetic Kurucz functions. The inclusion of magnetic forces changes the structure of an atmosphere by altering the net gravity and thus the pressure distribution in the upper layers of the atmosphere. These magnetic forces cause the structure of the stellar model to vary with latitude and to differ from the non-magnetic case. The enhanced blanketing represented by the magnetic ODF's in combination with the structure changes cause the emergent spectrum to vary with viewing inclination and to differ from the non-magnetic case. The structure and spectra computations are described and results compared with those for non-magnetic models. The results are discussed in light of existing observations of Ap stars. Dissert. Abstr.

N84-14165# Joint Publications Research Service, Arlington, Va.
FUNDAMENTAL ASTROMETRY TODAY AND TOMORROW
M. S. Zverev *In its* USSR Rept.: Space, No. 25 (JPRS-84946) 14 Dec. 1983 p 41-47 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 3, May - Jun. 1983 p 16-21 (For primary document see N84-14159 05-12)
Copyright. Avail: NTIS HC A07

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-15002 California Inst. of Tech., Pasadena.
NUCLEAR STRUCTURE OF QUASARS AT 329 MEGAHERTZ Ph.D. Thesis
Richard Stanley Simon 1983 179 p
Avail: Univ. Microfilms Order No. DA8315857

Compact quasars using Very Long Baseline Interferometry at 329 MHz were studied. Hybrid maps of 3C147 and 3C286, made at 329 MHz from VLBI observations were taken in 1975 with three stations. Further 329 MH2 VLBI observations are presented. Seven stations were added to map the quasars 3C48, 2C147, 3C209.1, 3C380, and 3C454.3. Dissert. Abstr.

N84-15003 Pennsylvania Univ., Philadelphia.
K-TYPE OVERCONTACT BINARIES Ph.D. Thesis
David Hart Bradstreet 1983 148 p
Avail: Univ. Microfilms Order No. DA8315992

As of 1981 there were practically no observational data concerning K-spectral type close binary stars. The purpose of this dissertation was to accumulate and analyze light curves of five binaries with periods less than 0.3 days, with the intention of providing a better statistical base of data which might shed light on existing theoretical models pertaining to the origin, structure, and evolution of these systems. The five systems observed were CC Com, BIVul, VZ Psc, FS CrA, and FG Sct. The observations were obtained at Kitt Peak National Observatory, Cerro Tololo InterAmerican Observatory, and Flower and Cook Observatory. These data were analyzed using the Wilson-Devinney light curve synthesis code and satisfactory solutions were obtained for four of the binaries. A unique solution was not possible for VZPsc, and this system merits further study because of the peculiarities evident from its light curve, for example, an approximate temperature difference between the two component stars of 1000 K. Dissert. Abstr.

N84-15004 California Inst. of Tech., Pasadena.
THE STRUCTURE AND EVOLUTION OF INTERACTING BINARY GALAXIES Ph.D. Thesis
Kirk Daniel Borne 1983 206 p
Avail: Univ. Microfilms Order No. DA8315842

A numerical code was constructed for the study of the evolution of interacting binary galaxies. This 'multiple three-body' algorithm (MTBA) essentially involves N concurrent three-body integrations. MTBA incorporates a violent relaxation phase that allows the particles to redistribute themselves in the gravitational field of the perturber prior to the full binary orbital evolution calculation. This redistribution is important for systems with an initially strong tidal potential; their predicted merger times are 50-100% larger than previously estimated. Merger times are tabulated both for circular and for elliptical orbits. Typical close binary galaxies will merge in about twice their initial binary oribtal periods. A specific interacting binary simulation is described in detail in the first paper. Many of the results reported here are consistent with those obtained from the larger, more expensive N-body simulations. MTBA is altered so that each 'galaxy' is represented by a configuration of test particles. Dissert. Abstr.

N84-15005# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE REVISED AFGL (AIR FORCE GEOPHYSICS LABORATORY) INFRARED SKY SURVEY CATALOG
Stephan D. Price and Thomas L. Murdock 16 Jun. 1983 164 p
(AF Proj. 7670)
(AD-A134007; AFGL-TR-83-0161; AFGL-AFSG-442) Avail: NTIS HC A08/MF A01 CSCL 03/2

Infrared survey measurements obtained from two probeborne experiments flown in 1982 combined with extensive ground-based observations on AFGL sources are incorporated into a revised AFGL Four Color Infrared Survey catalog. Over 92 percent of the sky has been covered at 11 and 20 micron, 71 percent at 4 micron and 47 percent at high sensitivity at 27 micron. There are 2970 entries in the main catalog, most of which are multicolor observations. The catalog contents are resolved into two general groups: a disk population (slope= 0.4) with means colors m (11)-m(20)=2.0 and m(20)-m(27)=0.9 corresponding to color temperatures of 270K and 185K, respectively, and a spherical distribution (slope = 0.6) with a mean color difference of m(11)-m (20)=1.0 corresponding to T sub c approx = 10 480K. GRA

N84-15006# Los Alamos Scientific Lab., N. Mex.
SOME OBSERVABLE INDICATORS OF S-PROCESS ENVIRONMENTS
Keith H. Despain 1983 4 p refs Presented at the IAU Symp. on Observational Tests of Stellar Evolution Theory, Geneva, 12-16 Sep. 983
(Contract W-7405-eng-36)
(DE84-001720; LA-UR-83-2930; CONF-8309172-2) Avail: NTIS HC A02/MF A01

By definition, the chemically peculiar stars have element abundances that are nonsolar. Many of these stars show peculiarities in s process elements. Observable indicators of the neutron environment for the s process in these stars are discussed. DOE

N84-15007# Los Alamos Scientific Lab., N. Mex.
ROLE OF THE RADIATION PRESSURE GRADIENT IN GIANT AND SUPERGIANT STAR EVOLUTION
Wendee M. Brunish, Arthur N. Cox, Stephen A. Becker, and Keith H. Despain 7 Oct. 1983 4 p ref Presented at the IAU Symp. on Observational Tests of Stellar Evolution Theory, Geneva, 12-16 Sep. 1983
(Contract W-7405-eng-36)
(DE84-001715; LA-UR-83-2969; CONF-8309172-3) Avail: NTIS HC A02/MF A01

Since some of the earliest evolutionary calculations it was found that post main sequence stars become red giants (e.g., Sandage and Schwarzschild, 1952). However, the exact physical processes that lead to and determine the rate of redward evolution are not completely understood. The redward evolution might be due to an increase in radiation pressure somewhere in the star that causes the layers above it to be pushed outward, resulting in an expanded envelope and a cooler surface temperature. If the radiative liminosity somewhere in the star approached the Eddington limit, the outer layes would obviously expand. However, due to the presence of gas pressure, the critical value for expansion would be somewhat less than the Eddington limit. DOE

N84-15008# California Univ., Livermore. Lawrence Livermore Lab.
RADIATION TRANSPORT IN NUMERICAL ASTROPHYSICS
C. M. Lund Feb. 1983 35 p refs Presented at the Numerical Astrophys. Meeting., Urbana, Ill., 21-23 Oct. 1982
(Contract W-7405-eng-48)
(DE84-002011; UCRL-88720; CONF-8210111-3) Avail: NTIS HC A03/MF A01

Numerical techniques developed by Jim Wilson and coworkers for the calculation of time dependent radiation flow are discussed. Difference equations for multifrequency transport are given for both a discrete angle representation of radiation transport and a Fick's law like representation. These methods have the important property that they correctly describe both the streaming and diffusion limits of transport theory in problems where the mean free path divided by characteristic distances varies from much less than one to much greater than one. They are also stable for timesteps comparable to the changes in physical variables, rather than being limited by stability requirements. DOE

N84-15009# Washington Univ., Seattle. Physics Lab.
THE 182-Hf: A NEW SHORT-LIVED r-PROCESS CHRONOMETER
E. B. Norman and D. N. Schramm (Chicago Univ., Ill.) 1983 2 p refs Presented at the 46th Ann. Meeting of the Meteoritical Soc., Mainz, West Germany
(Contract DE-AC06-81ER-40048)
(DE83-015698; DOE/ER-40048/57; CONF-8306115-1) Avail: NTIS HC A02/MF A01

The r-process only (182)Hf which can resolve the question of whether heavy element nucleosynthesis occurred during the nucleosynthetic event was proposed. The answer to the question will clarify the chronology of the solar system and will help to determine the astrophysical sites of heavy element nucleosynthesis. DOE

N84-15010 Texas Univ., Austin.
THE ABUNDANCES AND EVOLUTIONARY STATE OF THE EARLY R STARS Ph.D. Thesis
James Franklin Dominy 1983 459 p
Avail: Univ. Microfilms Order No. DA8319583

This dissertation presents the results of the first spectroscopic study of a sample of early R stars. Moderate reslution spectral observations of 14 stars having Harvard classes R0-R5 were obtained with the 4-meter echelle, 2.7-meter grating Reticon, and 4-meter Fourier transform spectrometers. From this data the abundances of C, N, O, Ti, Fe, 12C/13C and five elements formed by the s-process were derived. The direct measurement of the oxygen abundance is the first such determination for a warm carbon star. The abundance analyses were carried out with multi-layer, line blanketed model atmospheres and spectrum synthesis programs. Stellar parameters for comparison with the models (T sub log g) were derived primarily from calibrated infrared photometry and an assumed stellar mass. Dissert. Abstr.

N84-14203# Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
CRITICAL VELOCITY EXPERIMENTS IN SPACE
E. Moebius *In* ESA Active Expts. in Space Jul. 1983 p 215-226 refs (For primary document see N84-14172 05-12)
Avail: NTIS HC A17/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-15011 California Inst. of Tech., Pasadena.
CARBON MONOXIDE IN THE ATMOSPHERES OF THE TERRESTRIAL PLANETS Ph.D. Thesis
Robert Todd Simpson Clancy 1983 317 p
Avail: Univ. Microfilms Order No. DA8315845

The different time scales for variations of CO in the upper atmospheres of Venus, the Earth, and Mars are noted. The long diurnal period of Venus produces a very strong diurnal variation in mesospheric CO which is driven primarily by subsolar to antisolar circulation. The CO in the terrestrial mesosphere shows strong seasonal variation which is apparently produced by seasonally driven meridional circulation. By contrast, if atmospheric CO does vary on Mars, it is most likely controlled by long-term changes in the chemistry and/or vertical mixing in the Martian atmosphere. Dissert. Abstr.

N84-15012*# Planetary Science Inst., Tucson, Ariz.
ANALYSIS OF REGOLITH ELECTROMAGNETIC SCATTERING AS CONSTRAINED BY HIGH RESOLUTION EARTH-BASED MEASUREMENTS OF THE LUNAR MICROWAVE EMISSION Final Report
Stephen J. Keihm 31 Jul. 1983 10 p refs
(Contract NASw-3244)
(NASA-CR-174577; NAS 1.26:174577; SAI-1-141-00-0374-00) Avail: NTIS HC A02/MF A01 CSCL 03B

When high resolution measurements of the phase variation of the lunar disk center brightness temperature revealed that in situ regolith electrical losses were larger than those measured on returned samples by a factor of 1.5 to 2.0 at centimeter wavelengths, the need for a refinement of the regolith model to include realistic treatment of scattering effects was identified. Two distinct scattering regimes are considered: vertial variations in dielectric constant and volume scattering due to subsurface rock fragments. Models of lunar regolith energy transport processes are now at the state for which a maximum scientific return could be realized from a lunar orbiter microwave mapping experiment. A detailed analysis, including the effects of scattering produced a set of nominal brightness temperature spectra for lunar equatorial regions, which can be used for mapping as a calibration reference for mapping variations in mineralogy and heat flow. A.R.H.

N84-15013*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
OUTER SATELLITE ATMOSPHERES: THEIR EXTENDED NATURE AND PLANETARY INTERACTIONS Interim Report, Sep. - Nov. 1983
William H. Smyth and Michael R. Combi Dec. 1983 12 p refs
(Contract NASw-3387)
(NASA-CR-174579; NAS 1.26:174579) Avail: NTIS HC A02/MF A01 CSCL 03B

Model calculations for the spatial morphology of the Region B sodium cloud are presented that include both the oscillating plasma torus sink and solar radiation pressure in the D-lines. These calculations exhibit the qualitative behavior observed in the sodium cloud and have diagnostic capabilities to probe more deeply the atom ejection characteristics of the sodium source. Significant progress in specifying the plasma properties of Saturn's magnetosphere for use in the Titan hydrogen torus model is reported. Efforts to apply the AER comet model to calculations of the spatial distribution of the H atoms in cometary atmospheres are also discussed. Author

N84-15014*# National Aeronautics and Space Administration, Washington, D. C.
ETCHING OF MOLDAVITES UNDER NATURAL CONDITIONS
V. Knobloch, Z. Knoblochova, and Z. Urbanec Mar. 1983 10 p refs Transl. into ENGLISH from Cas. Narodniho Muzea v Praze, Rada prirodovedna (Czechoslovakia), v. 149, no. 3-4, 1980 p 140-144 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77334; NAS 1.15:77334) Avail: NTIS HC A02/MF A01 CSCL 03B

The hypothesis that a part of the lechatellierites which originated by etching from a basic moldavite mass became broken off after deposition of moldavite in the sedimentation layer is advanced. Those found close to the original moldavite were measured for statistical averaging of length. The average length of lechatelierite fibers per cubic mm of moldavite mass volume was determined by measurement under a microscope in toluene. The data were used to calculate the depth of the moldavite layer that had to be etched to produce the corresponding amount of lechatelierite fragments. The calculations from five 'fields' of moldavite surface, where layers of fixed lechatelierite fragments were preserved, produced values of 2.0, 3.1, 3.5, 3.9 and 4.5. Due to inadvertent loss of some fragments the determined values are somewhat lower than those found in references. The difference may be explained by the fact that the depth of the layer is only that caused by etching after moldavite deposition. Author

N84-15015 Colorado Univ., Boulder.
CARBON MONOXIDE FOURTH POSITIVE ULTRAVIOLET AIRGLOW EMISSIONS ON VENUS Ph.D. Thesis
Roy A. L. Swanson 19[illegible]12 p
Avail: Univ. Microfilms Order No. DA8317698

The ultraviolet spectrometer experiment aboard the Pioneer Venus orbiting spacecraft has recorded airglow spectra of the carbon monoxide (CO) fourth positive emission bands in the lambda 1250-1800 A spectra region. Extended duration of the PV mission since the December 4, 1978 orbit insertion has afforded opportunity to obtain many disc spectra, composite disc images and limb emission altitude profiles of the strongest (A'pi fields X' sigma +) electronic bands. Data were analyzed in terms of high resolution theoretical synthetic spectra calculated from a detailed multiple scattering radiative transfer model which postulates population of the excited II electronic state by the mechanisms of solar resonance absorption and photoelectron impact excitation of CO, excitation by solar ultraviolet photolysis and photoelectron impact dissociation of CO2, and dissociative recombination of CO2+ ions with thermal electrons. The predominant emission sources prove to be solar resonance scattering and dissociative recombination for all bands except those of the v' = 14 vibrational progression which are excited solely by resonance absorption of solar Lyman-alpha. Agreement between theory and observations is quite good with discrepancies attributable to uncertainties in the solar flux and instrument calibration. The density distribution of CO molecules below the 137 km turbopause altitude is inferred from the (14,5) band limb emission profile. Dissert. Abstr.

N84-15016 Michigan Univ., Ann Arbor.
OSCILLATIONS OF A SLOWLY ROTATING WEAKLY STRATIFIED GASEOUS PLANET Ph.D. Thesis
James Allen Leo 1983 130 p
Avail: Univ. Microfilms Order No. DA8314314

The eigenfrequencies and the radial structure of acoustic, gravity and rotational modes are computed for a slowly rotating, weakly stratified, polytropic gaseous sphere. A scaling procedure is employed which allows the high frequency acoustic and external gravity modes and the lower frequency internal gravity and rotational modes to be treated separately. This method involves the use of the anelastic approximation for treating the low frequency modes, and shows, for these modes, that the effect of perturbations of the gravitational force on the eigenfrequencies is of secondary importance. Also, non-sphericity effects for all modes are found to be negligible. The internal gravity and rotational modes uncouple when the square of the ratio of the rotational frequency to that of the Brunt-Vaisala frequency is small. For this case, the lowest order r-modes are non-divergent Rossby-Haurwitz waves. The significance of the internal gravity and rotational modes in understanding the dynamics of the atmospheres of the Jovian planets is also discussed. Dissert. Abstr.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-15017 State Univ. of New York, Albany.
AN ANISOTROPIC MODEL OF DIFFUSE SOLAR RADIATION WITH APPLICATION TO AN OPTIMIZATION OF COMPOUND PARABOLIC COLLECTORS Ph.D. Thesis
Richard Robert Perez 1983 181 p
Avail: Univ. Microfilms Order No. DA8315071

Based on a simple geometrical description of the sky hemisphere and the magnitude of the horizontal diffuse radiation, a model for estimating diffuse radiation impinging on sloping surfaces was developed. Tests against data show that substantial improvement is achieved over the classical isotropic model for any collector slope or orientation. Improvement is found for instantaneous as well as accumulated data. The application of the model to compound parabolic collectors (CPC) accounts partly for the role played by forward scattered radiation in the total energy they receive. An optimization of CPC's geometrical characteristics is performed for photovoltaic generation in the area of Albany, NY. This calculation is used to assess the relative effects of meteorological conditions and economic assumptions or optimum concentration values, and provides the reader with information pertaining to the variation of the cost of electrical energy produced as a function of the cost of silicon solar cells. Dissert. Abstr.

N84-15018# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA COMPREHENSIVE REPORTS, NO. 466. DATA FOR DECEMBER 1982 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 462 (SUPPLEMENT), PART 2
Helen E. Coffey, ed. Feb. 1983 93 p 2 Vol.
(PB83-253443; SGD-466-Pt-2; NOAA-83082402-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 03B

Solar radio emission, solar X-ray radiation, and mass ejections from the Sun are covered. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-15019 California Inst. of Tech., Pasadena.
NON-EQUILIBRIUM X-RAY EMISSION FROM YOUNG SUPERNOVA REMNANTS Ph.D. Thesis
John Joseph Nugent 1983 153 p
Avail: Univ. Microfilms Order No. DA8315853

A computer model was developed to predict the X-ray spectra from the hot, shock-heated plasmas that are found in the remnants of supernovae. The model accounts for the lack of collisional ionization equilibrium and for the possible lack of thermal equilibrium between the electrons and ions behind the shock fronts. Both of these effects are potentially important in determining the emergent X-ray spectrum of young supernova remnants (SNR). Both a spectral component arising from the supernova ejecta and a component arising from the shocked interstellar medium surrounding the supernova are calculated. Dissert. Abstr.

N84-15020 Princeton Univ., N. J.
LARGE SCALE ANISOTROPY OF THE 3K COSMIC BACKGROUND RADIATION AT 24.8, 31.4 AND 46.0 GHz Ph.D. Thesis
Edward Sekong Cheng 1983 154 p
Avail: Univ. Microfilms Order No. DA8316790

The 3K cosmic background radiation (CBR), believed to be the signature of the initial singularity in 'big bang' cosmologies, is a fundamental tool for understanding the structure of the early universe. We describe here a measurement of the spatial anisotropy of this radiation at a sensitivity of 6 parts in 10 to the 5th. The observations were carried out in a balloon-borne package using three room temperature, correlation-type microwave radiometers, with 500 MHz bandwidths centered at 24,8,31.4 and 46.0 GHz. The achieved system noise temperatures for the three receivers is 800K. Three flights between August 1978 and July 1980 cover the entire Northern Hemisphere sky, allowing for tests of both dipole and higher order anisotropies. Dissert. Abstr.

N84-15021# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCERNING THE POSSIBILITY OF EMPLOYING SUPERCONDUCTING SYSTEMS FOR ANALYZING THE COMPOSITION OF COSMIC RAYS
O. P. Anashkin, B. M. Belitskiy, V. B. Brodskiy, L. V. Kurnosova, and N. N. Mikhaylov 27 Sep. 1983 9 p Transl. into ENGLISH from Kosmich. Luchi, Sb. Statey (USSR), no. 13, 1972 p 166-168 (AD-A133792; FTD-ID(RS)T-1010-83) Avail: NTIS

HC A02/MF A01 CSCL 04/1

The experimental results on the use of superconductive systems onboard spacecraft are described. To ensure low temperatures in the cryostat under weightlessness helium was used at a pressure above the critical value. In flight the temperature was controlled at six points while the pressure and intensity of the magnetic field were controlled in the solenoids. M.G.

N84-15022# Los Alamos Scientific Lab., N. Mex.

THE 3-10 keV AND 0.1- TO 2-MeV OBSERVATIONS OF 4 GAMMA-RAY BURSTS

J. G. Laros, W. D. Evans, E. E. Fenimore, R. W.. Klebesadel, S. Shulman (NRL, Washington, D.C.), and G. Fritz (NRL, Washington, D.C.) 1983 13 p refs Presented at the Workshop on High Energy Transients, Santa Cruz, Calif., 11 Jul. 1983
(Contract W-7405-eng-36)
(DE84-001334; LA-UR-83-2657; CONF-830797-5) Avail: NTIS HC A02/MF A01

Four catalogued (BETA) ray bursts that occurred between 79/3/7 and 79/7/31 were observed over the 3 to 10 keV range. The bursts were also well observed by members of the interplanetary network. Hardness ratios, X-ray/(BETA)-ray luminosity ratios, and are presented. The results are summarized as follows: (1) gamma ray bursters can emit fairly strongly at X-ray energies near the time of the (BETA) burst with L/sub x//L/sub (BETA)/ approx. .02 (L/sub x/ approx. 10(37) ergs s(+1), 3 to 10 keV, assuming a distance of 1 kpc); (2) the centroid of the X-ray emission generally lags the (BETA)-ray centroid, but there is also evidence for one or more types of X-ray precursor activity; (3) the (BETA)-ray hardness ratios were not highly variable for these particular events; (4) the X-ray/(BETA)-ray power law number index during times of the strongest (BETA)-ray emission ranged from 0.8 to approx. 1.1 for the four bursts; (5) the X-ray tail of GB790307 probably can be modeled as the cooling of hot plasma generated during the (BETA)-ray burst. Simple versions of this model can be used to estimate various source parameters. These estimates imply a distance of a few hundred to a few thousand pc; (6) gamma-ray bursters probably do not produce events similar to classical X-ray bursts independently of the (BETA)-ray emission. DOE

99 GENERAL

N84-15023# Telecom Australia Research Labs., Melbourne.

REVIEW OF ACTIVITIES, 1982 - 1983

1983 103 p Original contains color illustrations
(ISSN-0314-1357) Copyright. Avail: Issuing Activity

Current activities, consultative activities, and laboratory summaries are presented. N.W.

N84-15024# Naval Postgraduate School, Monterey, Calif.

A SUMMARY OF THE NAVAL POSTGRADUATE SCHOOL RESEARCH PROGRAM Technical Report, 1 Oct. 1981 - 30 Sep. 1982

William M. Tolles May 1983 433 p
(AD-A132871; NPS-012-83-004PR) Avail: NTIS HC A19/MF A01 CSCL 05/9

This report contains 249 summaries on research projects which were carried out under funding to the Naval Postgraduate School Research Program. This research was carried out in the areas of Computer Science, Mathematics, Administrative Sciences, Operations Research, National Security Affairs, Physics, Electrical Engineering, Meteorology, Aeronautics, Oceanography and Mechanical Engineering. The Table of Contents identifies the areas of research. Author (GRA)

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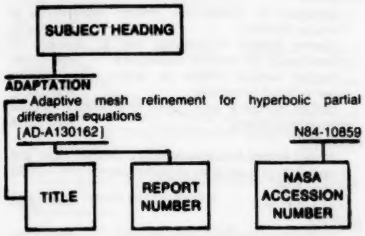

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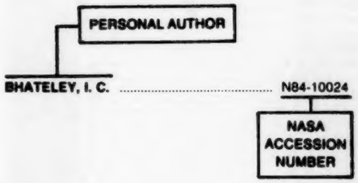

Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

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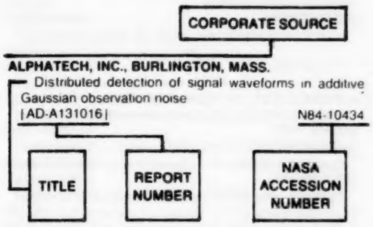
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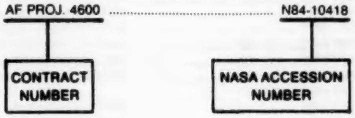

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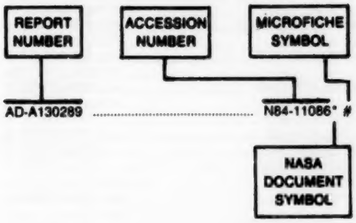

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